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WITH

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ARCHIVES OF
PHYSICAL THERAPY, X-RAY
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VOL. VII DECEMBER, 1926 No. 12

SURGICAL TUBERCULOSIS: ABROAD*

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IT is commonly admitted today that of all the infectious diseases, tuberculosis is the one in which the notion of the "soil" plays the most important role. This truth has taken many years to be realized. Too long the belief reigned that the lesions produced by Koch's bacillus constituted a purely local affair, curable by antiseptics or by the knife, as a tumor may be cured by operation. A fundamental mistake underlay this attitude. The manifestations of external tuberculosis, wherever they may appear, are only the local symptoms of general diathesis. Their mode of development depends much less on the virulence and number of the lesions than of the defenses, local and general, of the organism attacked and on the resistance of the "soil."

A rational therapy of surgical tuberculosis would abandon direct intervention, so often disappointing and which in any case only aims at the eradication of the local lesion and would seek first to stimulate the vital activity of the organism and to give it the best possible opportunity of defending itself. It would seek its cures through the active co-operation of the patient, invoking the aid of the great healer, Nature. Finally, it could employ any local treatment which did not interfere with the treatment of the general condition.

Heliotherapy would seem to fulfill these three conditions. It can be practiced wherever the sun shines—either on the plain, by the sea, or on the mountain side. A high altitude is probably the place of choice, both because heliotherapy can be carried out throughout the year—and because it is there associated with the air cure, in the stimulating keen mountain air, which contributes in so

*Read at fourth annual meeting American College of Physical Therapy, Chicago, Oct. 19, 1925.
Case No. 2909

large a degree to the general recovery of the organism.

The sun bath consists in the regular exposure of the body integuments to the sun. The skin in contact with its natural surroundings, the air and the sun, is toned up and becomes pigmented. It recovers its manifold physiological activities, indispensable for the normal activity of the organism, and becomes again, as intended by nature, a real covering.

Pigmentation confers on the individual an increasing resistance to cold and heat; protects against the entry of harmful bacteria, as also against wound infection and favors the cicatrization of the latter. Thus, pigmented skins are resistant to many cutaneous affections, e. g., furunculosis, acne, etc., which often provide a door of entry to more serious infections. The pigment seems to act as an accumulator of force. The everyday experience that the resistance of a patient is proportional to his pigmentation confirms this idea. The pigment not only serves as a protection for the skin against the irritation of the ultra violet rays, but also regulates the thermic effect of the sun. The biological value of pigment becomes clearer every day.

We attribute to it a power of transformation analogous to that discovered by Dreyer in the case of certain fluorescent substances, e. g. eosine and erythrosine, which are capable of transforming the short rays into rays of greater length. Finally it is likely that the pigment as a lipoid, receives active substances and (under the influence of light as has been shown to be very probably the case for the antirachitic elements by the work of Hess and his collaborators), probably furnishes ingredients essential to the various hormones.

PHYSIOLOGICAL ACTION

The sun bath, by dilating the capillaries, determines a flow of blood to the

Fig. 1—A. Extensive lupus of the face.
B. Cured after twelve months heliotherapy in Leysin.

surface from the muscles and thus activitates and regularizes the circulation better than the best massage. It strengthens the musculature and re-establishes the harmony of the body. This reformation of muscles is probably due to a continual tonic action of the muscle fibre which follows the vibratory shock of sun's rays on the close mesh of sensory nerve endings in the skin. By toning up the muscles, the sun cure increases their actions on the bony levers, and by a process eminently physiological, favors the return of articular function. Its influence extends to the ligaments and the bony skeleton, clearly activitating the recalcification of the latter. This property noted by us at the beginning of our work has been again brought to light by the recent researches of many authors on rickets (Huldschinski, Hess, Lesne, etc.) The tonic effect of the sun shows itself also on the thoracic and abdominal organs. The combined air cure and sun bath, particularly at a high altitude, sharpens the appetite, stimulates the digestive functions and re-establishes the general strength. Under its influence the number of blood corpuscles increases, as also the blood content in haemoglobin. The blood formula improves and the nutrition and general metabolism become more active. The favorable action of heliotherapy on the internal secretions should also be noted. Leysin, before becoming a heliotherapy center, was used for the treatment of cases of thyroid insufficiency.

What is then the mode of action of the sun on the human body?

Without going into full detail, we may remark that the effect of the sun is to be attributed to the synthesis of activity found in white light, and not to one or other of the isolated wave lengths, be it ultra violet or infra red.

In view of the fact that the bactericidial action of the ultra violet wave lengths does not penetrate beyond the surface, there has always been considerable scepticism as to the possibility of light having a direct action on the deep tuberculous lesions.

Fig. 2—A. Voluminous Adenitis.
B. Cured after six months.

Wiesner's experiments have shown that the infra red wave lengths, particularly those nearest the red, which penetrate the organism, have also bactericidal properties and are capable of influencing the deep lesions directly. Further they have a vasodilatory effect, which promotes phagocytosis and the appearance of the pigmentogenic oxydative ferments of the skin.

As regards the indirect action of light, numerous experiments (e. g. those of Bloch, Naegeli, Rothmann, Pinkussen, etc.) have proved its efficacy. Their conclusion explains in great part the modifications occurring in the organisms of those suffering from surgical tuberculosis when submitted to the helio-alpine treatment. Briefly they conclude that blood, by absorbing light, provides a reservoir of radiant energy, which activates the processes of oxydation and reduction throughout the organism. The total metabolism is thereby favorably influenced and the body defences increased. The body is thus better able to struggle against or extinguish an infection.

Not only is heliotherapy the best general treatment of external tuberculosis, but it is also without a rival as a local treatment, by reason of the analgenic, bactericidal and sclerogenic powers of the solar rays. Combined with immobilization and extension, it rapidly decreases the pain in all form of tuberculosis, arthritis and finally causes its dis-

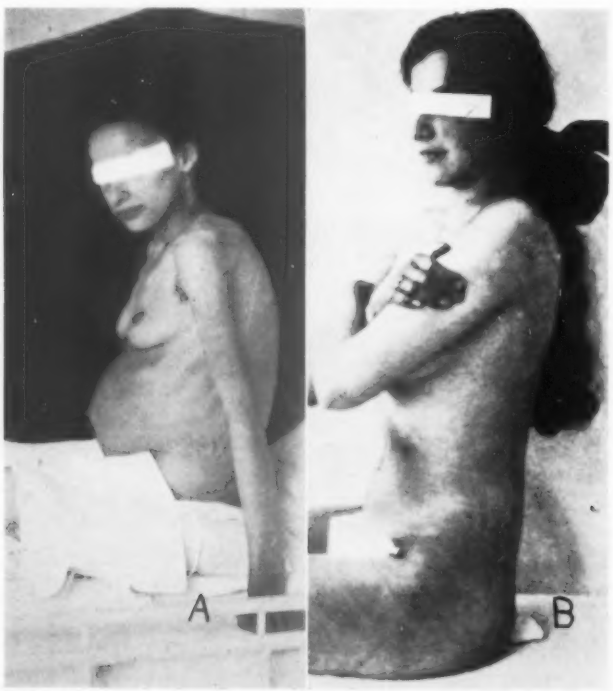


Fig. 3—A. Peritonitis with ascitis and pleural effusion.
B. The same case, cured after one year's heliotherapy treatment.

appearance. The same may be said of peritonitis and cystitis, with careful dosing. The solar rays cause also the cicatrization of sluggish chronic wounds, for which they form an ideal dressing, destroying the infectious germs, better than the best antiseptic and stimulating the cellular defense.

Osteites and arthritis at every stage of their development belong to the province of heliotherapy.

Our experience controlled by the service of more than 15,000 x ray plates, proves that no lesion, however deeply situated, escapes the influence of the helio-alpine treatment. In Pott's disease, of whatever localization, one sees progressive sclerosis of widespread lesions, disappearance of the accompanying cold abscess, or dense calcification of its remains. The formation of solid blocks, joined by intervertebral osseous bridges leads to a firmer consolidation than the best bone grafts.

In hip joint disease, both in adult and child, even when the cotyloid cavity—the head and often the whole neck—show signs of advanced dissolution (shown on the x ray by a cloudiness blotting out the outline of the articulation), a new head and a new cavity may be seen to appear out of the chaos, with gradually increasing precision of outline. The demarcation zone becomes more and more defined and the atrophied parts are the seat of an intense recalcification.

In other cases where the head of the femur had broken through the caseous floor of the cavity, the x ray registers the stages of a gradual reconstruction. First there appears a solid partition of rude trabecular structure, which later becomes compact and regular, forming a new articular cavity. The new cavity adapts itself to the new head of the femur, giving a functional result, often beyond all that had been hoped. Similar unhoped for transformations are seen in the x ray of osteo-arthritis of the knee, shoulder, elbow and wrist. For instance in the knee, even where the arthritis has already destroyed the cartilages and the articular surface, the reconstruction of these parts is common,

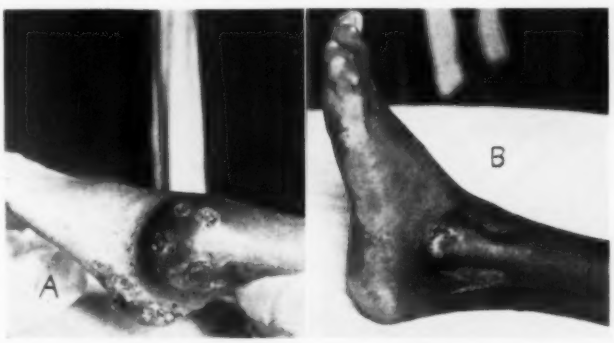


Fig. 4—A. Tibio-tarsal arthritis of old standing with sinuses—amputation had been advocated.
B. The same patient cured after 7 months, with return of articular function.

and we have seen it reach the *restitutio ad integrum*. In case of spinae-ventosae, phalanges entirely destroyed by the disease show on the x ray when cured such a compact structure with such clear outlines that they no longer can be distinguished from healthy phalanges. A series of x ray plates demonstrate the successive phases of spontaneous elimination of deep-lying sequestra and show how the demarcation comes about between the healthy parts, which it is in the interest of the organism to preserve, and those of which it must get rid. Heliotherapy, favorable as may be its influence on the tuberculous articulations, cannot always correct faulty position. Intelligent orthopaedics are therefore also necessary. The conditions of the sun-cure have led us to break with the usual methods and to adopt a system of our own, with extremely simple devices for extension and immobilization. The main principles are to facilitate the access of the sun to the diseased part, to avoid all interference with local circulation, and with the reformation of the muscles, which we regard as indispensable. We have thus been led to forbid absolutely for Pott's disease and other tubercular articulations the use of the closed plaster casts which deprive the parts most in need of contact with the sun and the air, destroy the skin function, and increase the tendency to maceration of the integuments with atrophy of the muscles and bones. For Pott's disease, as for the arthritis of the lower limbs, immobilization in the horizontal position is an indispensable adjunct to heliotherapy. The thorax may be fixed by a canvas waistcoat, by opening which the whole front of the body is exposed to the sun. In Pott's disease, complicated by Gibbus, we seek to reduce the Gibbus by applying a gradually increased pressure produced by the

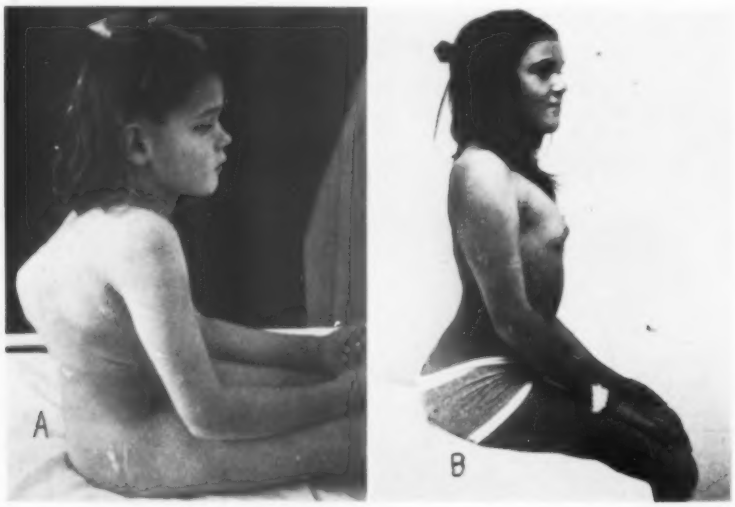


Fig. 5—A. Pott's disease, with marked curvature and paralysis.
B. The same patient cured after 15 months.

body weight alone. To this end we use cushions of millet seed or sand of gradually increasing thickness and consistence.

As soon as the formation of a vertebral block permits, we place the patient in the ventral position, thus permitting of insolation of the back and vertebral column. In the ventral position, the natural tendency of the patient to lift his head accentuates the natural physiological lordosis. Thus it constitutes a rational method for the correction of deformity and favors the development of the scapulo-humeral muscles, as well as those of the back. The patient ends by having a perfect natural corset, forming an ideal support for the vertebrae. The ventral position is also ideal from a physiological point of view, assisting the intestinal functions by the pressure exercised on the abdomen and favoring the development of the thoracic cage.

In hip joint disease immobilization of the pelvis, raised on a cushion, is combined with continual extension of the limb, by means of an apparatus which permits of free access of the sun to the whole coxo-femoral region. Thus we avoid any tendency to flexion; we develop and restore the musculature and we achieve often the return of articular function.

In arthritis of the knee or foot we combine with heliotherapy immobilization of the limb on an inclined plane to assist the circulation and thus to induce more rapid regression of capsular thickening and periarticular infiltrations. Another advantage of this treatment is the protection of surgical tuberculosis against mixed infections—thanks to the rarity of infectional germs, the resistance of the integuments and the increased local and general powers of defense. The prognosis of surgical tuberculosis, complicated with secondary infection, is contrarily almost as grave as the favorable results obtained in closed tuberculosis. One might almost say that our surgical cases never die of tuberculosis, but only of cardiac weakness or amyloid degeneration, consequent to the secondary infection, from which

Fig. 6—Rollier's school in the sun, for children predisposed and convalescents. A class in summer.

Fig. 7—A balcony for sun-cure in one of Dr. Rollier's clinics for children. In the foreground, several cases of Pott's disease in ventral position.

only too often the patients are suffering on arrival.

Tuberculosis of the pelvis, e.g. of the sacro-iliac articulation, amongst others, is invariably cured by the helio-alpine treatment when closed, even when associated with large cold abscesses, but it becomes one of the most tedious cases, when spontaneous opening or the surgeon's knife has transferred a harmless cold abscess into an infection burrowing in the recesses of the joint, practically inaccessible to drainage. Nevertheless the results of heliotherapy in these infected cases would appear to be better than those given by any other method. When curetting, antiseptic packings and douchings fail before interminable suppuration, the sun-cure remains the *refugium ultimum*. Under its influence atonic wounds recover a healthy aspect, fistulae become cleaner, and the articulations transformed into veritable pus-sponges are the seat of intense activity with spontaneous elimination of sequestra and dead tissue.

It should never be forgotten that heliotherapy, to attain good results, must be practiced according to strict posological rules. Any attempt to neglect these rules entails the danger of failure, which while discouraging the patient will discredit the method.

Before exposure, all the organs should be carefully examined, the lungs and the heart in particular are submitted to a detailed examination, and special records should be taken of the pulse, the respiration and the blood pressure.

Patients coming to the high Alps for the first time must first accustom themselves to the climatic conditions. From whatever lesion they may be suffering, we insist on their remaining in their room for a few days, during which time the temperature and nervous reflexes should be carefully controlled. The patient is then allowed on to his balcony and exposed by gradual stages to the sun, remembering always that an early violent reaction is the sign of difficult adaptation to the sun. To regulate the gradual progress of each patient to complete insolation, his degree of tolerance of the sun must first be established. This is best done by commencing the sun cure on the legs and feet. By exposing the lower limbs, i.e., a neutral region, one runs no risk and gets valuable hints for the general conduct of the cure. This derivative heliotherapy causes a flow of blood to the lower limbs and thereby a decongestion of the abdominal and thoracic organs; the exposures should last a few minutes and be separated by a rest interval.

As one approaches the body, the greatest circumspection should be used, more particularly if the patient has concomitant lung trouble. With sensitive patients, suffering from heart disease or simple tachycardia, the heart region should be covered with a white damp cloth; a white hat and smoked glasses are essential in order to protect the patient from stroke and sun-blindness.

During this time the general state of the patient's pulse, temperature, reflexes, etc., should be carefully watched, and at

the least sign of intolerance the exposures should be shortened or suppressed for the time.

When the integuments are well pigmented over the whole body, the time of which varies for each individual, one need no longer be so cautious. The patient may take several hours sun-bath without danger—three to four hours in winter and two to three hours in summer are generally sufficient and should not ordinarily be exceeded. There is no need for glass screen of any kind in the sun-cure.

Heliotherapy is not only the best local and general treatment for tuberculosis, it is also a precious psycho-therapeutic agent. The general health of the cases arriving in the mountains is usually bad, often enfeebled by long hospitalization in the plains, or by successive operations. In addition they are depressed and discouraged by the uselessness of the treatment they have followed. They have lost all faith in a possible cure and, what is much worse, the will to get better. They are in fact, cases that are as much psychical as physical. The influence of the helio-alpine treatment is remarkable in such cases. Under continuous and free exposure on their balcony, with free access of the air and sun, their depression soon disappears. The difference between the melancholy monotony of the four walls of an ordinary sick room to the perspective changing with the season (from the rich green of summer to the brilliant white of winter snow) is doubtless sufficient to account for this psychic change. However this may be, the fact is one of daily observation and constitutes a valuable auxiliary for the doctor in the psycho-therapeutic side.

As soon as the patient is well on the road to recovery, we combine with heliotherapy the work cure, which forms an important part of the treatment in all our popular clinics. The children follow the regular courses of instruction; the adults occupy their time with various kinds of hand-work. This handwork even in the case of those suffering from surgical tuberculosis and necessarily mobilized, does not in the least endanger their cure. On the contrary, it has a double advantage. It does away with boredom, that "soul-sickness," in the words of Dr. Vigne; a serious sickness, even though it figures in no textbook of pathology. Secondly it provides the patient with much needed recreation. Wood engraving decorative work in leather, typewriting and toymaking are the principal branches of activity of our surgical patients, according to each one's aptitudes and preferences.

The renewed activity while excellent for the patient's morale, reacts on his

Fig. 8—Convalescents from surgical tuberculosis practicing winter sports.

physical state and thus favors the progress of his cure.

The tuberculosis patient by recovering his taste for work recovers also his self-esteem and frees himself from the depressing idea of his uselessness. He thus reaches the first stage on the road back to a normal life.

As here outlined, heliotherapy would seem to give expression to the best ideals of orthopaedic and conservative surgery.

A splendid general health, resistant bronzed integuments, complete reformation of the musculature giving to old cachectics the bodies of athletes—such are the principal characteristics of the sun-cure, which gives back to society, not deformed wrecks, but men normal physically and morally and capable of earning their livelihood.

SURGICAL TUBERCULOSIS: AT HOME*

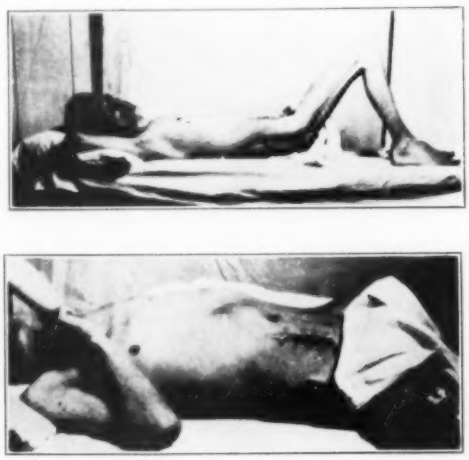
HORACE LOGRASSO, M. D.
Superintendent J. N. Adam Memorial Hospital,
Perrysburg, N. Y.

A quarter of a century ago the conception of the probabilities of heliotherapy existed only in the minds of a few pioneers in southern France and Switzerland who were endeavoring to blaze a trail through the fastnesses of ignorance and misconception concerning the nature and treatment of certain diseases, including so-called "surgical" tuberulosis. In its reception by the medical profession (both in Europe and in America) the sun cure idea ran the gamut from active opposition, ridicule and indifference to half-hearted approval and the actual acceptance. The last mentioned attitude has come to be a common one and we believe that now there are comparatively few wide-awake physicians in civilized countries who are not ready to apply sun cure when its use is indicated.

Foremost among those early pioneers stands Dr. Rollier, who is fittingly called the "father of heliotherapy," while Bernhardt, Poncet, Bonnet and others, by their experimental use of solar energy made valuable contributions to the sum of knowledge on the subject. It was Rollier, who, with a steadfastness of purpose and with a growing knowledge based on observation on an ever increasing number of patients, and with careful attention to minute details, set a satisfactory technique for the use of heliotherapy in tuberculosis—the field in which this form of therapy has found its widest usefulness. Having intended to devote his talent to surgery, Rollier, in his early career, served in the various clinics of Professor Kocher. Here he observed that the efforts of his chief, which gave admirable results in most cases, proved futile and even harmful when applied to

*Received for publication August 2, 1926.

so-called surgical tuberculosis, resulting, in many cases, in an aggravation and dissemination of the disease and oftentimes, in death. Looking for the cause behind the results he realized that tuberculosis, no matter in which part of the body its manifestations appeared, was a systemic disease and that its relief was not a surgical problem, but a medical one. He saw the necessity of using such measures as would tend to place the body organism in a state of defense by stimulating and aiding its native powers of resistance to disease.



Case No. 3766
Tuberculosis Peritonitis with Fecal Fistula Entrance

To effect this his idea was to make use of the great natural, health-promoting agencies—sun and fresh air, by placing his patients unclothed out-of-doors, having them live as near as possible like primitive savages, who, we are told, were free from tuberculosis and other diseases of civilization. In his remarkable results our brightest hopes were realized. His clinics at Leysin, Switzerland, became a veritable Mecca to which came not only sufferers in search of health, but physicians looking for more logical and successful methods of therapy.

An extensive study of Dr. Rollier's work gave inspiration to the late Dr. John H. Pryor of Buffalo to become the sponsor of heliotherapy in this community. The city of Buffalo had, a short time previously, opened up a hospital for tuberculosis in the Cattaraugus Hills at Perrysburg, and Dr. Pryor saw in this a very desirable locality for the new ad venture. With the force of his dominant personality he overcame the opposition

Twenty-one Months Later—Gain 17 lbs.

of the many who still regarded surgery as the method of choice in extra pulmonary tuberculosis, and by the excellent results of the work that he was conducting he changed indifference to respect, and half-heartedness to enthusiasm. Sun cure was begun in a small group of patients in the year of 1913. Since then, as the work has gradually progressed, capacity of the hospital has been increased from time to time to meet our growing demands. Since the last additions have been completed we have space to accommodate 525 patients with provisions for extending the use of heliotherapy to the majority of our pulmonary cases.

This brings us to a discussion of the much disputed question—the advisability of employing sun cure in pulmonary tuberculosis. Rollier, in his book, disclaims any right to pose as an authority on the subject since his experience has been confined largely to the non-pulmonary manifestations of the disease. He gives as his opinion, however, that it ought to prove successful, if judiciously applied, and advises experimental work in this direction. Up to 1922 our position in regard to the matter was the same as that of Dr. Rollier. Since that year we have each summer selected a series of cases for pulmonary sun cure. From our observations we have concluded that hemoptysis and other unfavorable reactions such as temperature, reactivation of the disease, etc., reported by adverse authorities are not likely to occur, provided that proper precautions are taken

Case No. 2909
Tuberculous Peritonitis with Sinuses
Entrance One Year Later

Case No. 3414
Tuberculosis of Hand and Wrist
Entrance Two years later
Gain 17 lbs.

Local Condition on Entrance

Local Condition Two Years Later

X Ray on Entrance

X Ray Two Years Later

and the details of the technique are carefully adhered to. We admit that there are cases in which its use is contraindicated, such as cases with marked activity or those with generalized tuberculosis. We certainly would not consider it prudent to place a pulmonary case under cure while having a hemorrhage—nor until two or three weeks after the hemorrhage has ceased. But in other cases, heliotherapy forms a most valuable addition to the regime usually described for pulmonary tuberculosis.

While it is desirable to practice sun cure where the sun shines practically the year round, this is not always practical either for economical reasons or because of family ties. For that reason we recommend that sun cure should be applied in any climate in which the sun shines a reasonable number of days in the year.

Flexion Deformity on Entrance

Entrance

Case No. 3300
Tuberculosis of Knee with Flexion Deformity and Sublaxation.

Same Boy Two Years Three Months Later Showing Marked Nutritional Change and Increase in Range of Motion. Gain 9 lbs.

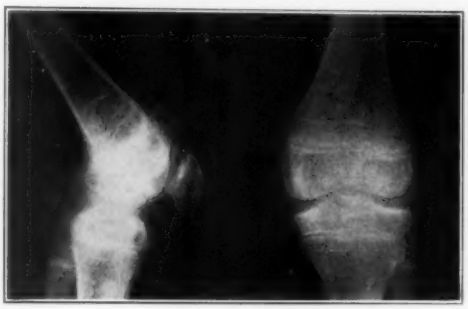
It is desirable that a locality with a fair altitude be chosen on account of the greater clearness and purity of the air. Depressing effects on hot days are less likely to occur under these conditions.

As to the proper length of exposures to be given, each locality must be a law unto itself. While Rollier's technique is safe and reliable to be used in the beginning as a working schedule, it must be modified to suit varying conditions. To the thoughtful mind it will soon occur that owing to variation in the density and humidity of the air in different climates and altitudes, the amount of solar energy transmitted during a given period will not be equal, nor will it be constant in any one place from day to day or from hour to hour. Thus two hours of sun in one place may be equal to two and one-half in another, with different atmospheric conditions. Hence our methods are purely empirical and one must proceed with caution until the correct dosage is found. A means of accurately measuring and recording the sunlight dose in terms of a definite unit instead of minutes and hours, is thus of importance. Dr. O'Brien, of our physics department, is developing a device which we hope will accomplish this.

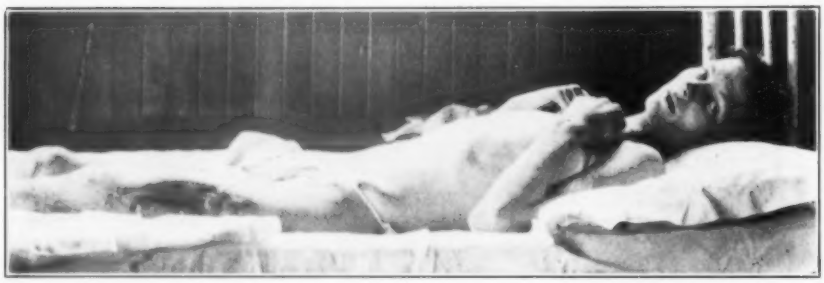
The time of day to be selected for sun cure varies according to the season. During the winter, early spring, and late fall, in the temperate zones, the middle portion of the day when the sun is more directly overhead and the temperature of the air is higher, is found to be the most comfortable for the patient. During the warm seasons, the cooler portion of the day is more desirable. Rollier gives his insolations early in the morning as soon as the sun is high enough to shine on the porches. We would be glad to follow his example were it not that labor conditions in America are so vastly different. As it is, we are obliged to commence somewhat later and in order to get in the three or four hours that the most of our patients receive, we divide the exposure into two periods, the second coming late in the afternoon.

On days when the sky is overcast with clouds the patient should undress and go out on the porches just the same to get the tonic effect of the air upon the body. Of course, in cold weather this air exposure must be much shorter than the regular irradiation periods, otherwise the patient would likely become chilled. Up-

Case No. 3300
A-P and Lat. X Ray on Entrance



X Ray Two Years Three Months Later



On Entrance
Case No. 4189
Tuberculous Osteomyelitis of Left Femur, wtih Patho logical Fracture.

Local Condition on Entrance

Fifteen Months Later

X Ray on Entrance

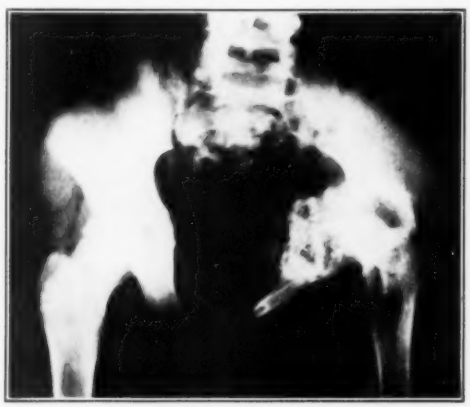
Fifteen Months Later

Fifteen Months Later

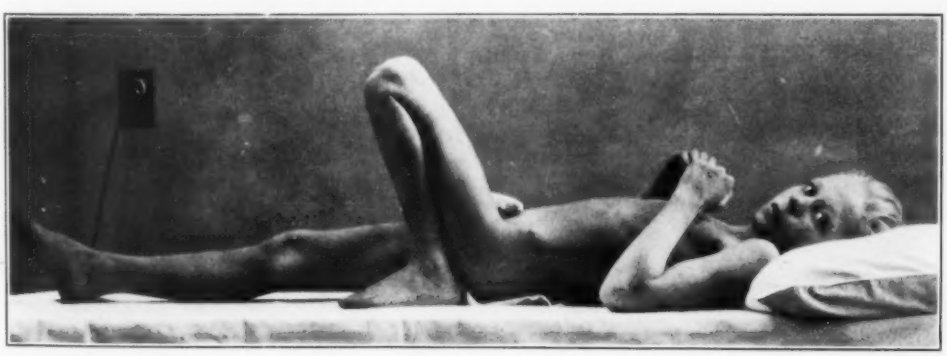
patients who are in good physical condition take their air baths while walking or playing, and in that case can remain out much longer with impunity. Our children sometimes play naked in the snow for as long as an hour at a time. In mild weather patients should be encouraged to be naked as much of the time as possible, being careful, however, not to remain in the direct rays of the sun except during regular irradiation periods. Children, on whom social demands fall very lightly, need dress but rarely during the summer months. Our little patients play and roam around the grounds and go to their meals during the summer months in very abbreviated trunks.

The matter of wind protection is an important point and should receive careful attention in giving either insolation or air baths. Where possible, institutions where heliotherapy is to form part of the treatment should be situated in such a way as to be sheltered naturally by hills or woods from the prevailing winds. Then, besides, wooden screens and canvas curtains on beds should be provided. While moving air playing on the body is to be desired on a very warm day when stagnant air is likely to be depressing, in

Case No. 5024
Tuberculosis Left Hip
Entrance. Showing Abscess Shadow Extending through Acetabulum into Pelvis.



Three and one-half Years Later, Showing Calcification of Abscess and Regeneration of Bone.



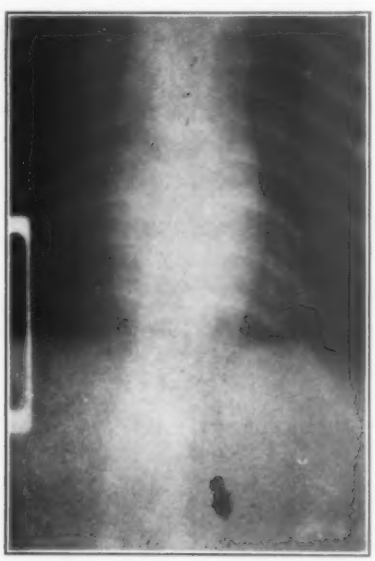
Three and One-Half Years after Entrance. Showing Amount of Motion. Boy Walks without Crutch or Cane. Gain 21 lbs.

cold weather a chilling breeze striking the patient may do very serious harm.

Before receiving the first insolation most patients require to become inured to the out-of-door life. The hardening process in many cases need to be only a short one, but where the patient is very emaciated and in poor physical condition, it must be very gradual and supervised with great caution. During this time his temperature, pulse, blood and urine findings should be recorded and studied to give a line on the individual patient. Cases showing marked nephritis or fever and emaciation must be more closely watched and more gradually and less intensely insolated.

In dealing with bone and joint tuberculosis all casts are discarded so that the sun may have free access to the whole surface of the body. It is, however, very erroneous to assume that immobilization is dispensed with; on the contrary, it is one of the essentials of heliotherapy and is effected by the rest in bed and simple orthopedic contrivances. Tractions and hard pillows are used a great deal to keep the diseased part in favorable position and to correct or prevent deformity. With the sun and fresh air to increase the resisting power of the patient and these various devices to give local relief and assistance, the best opportunity is being given the patient for a recovery from the disease and prevention of deformity.

We treat in bed all joint cases that are weight-bearing, regardless of their physical condition. Cases of peritonitis, renal tuberculosis, pleurisy with effusion and pyopneumothorax, whether they show fever or not, are also treated in bed until all symptoms and signs have subsided, all sinuses and ulcers have healed, and all fluid absorbed.



Entrance
Showing Paravertebral Shadow

Three Years Later
Showing Absence of Exudate

The generally accepted procedure in applying heliotherapy is to begin insolation by exposing the feet only, since this part of the body is most remote from the vital organs. The other parts of the body are exposed in the following order: legs, thighs, abdomen, and chest. The head is protected by a large bonnet or any device which will shade this part. During hot summer months we usually use a wet Turkish towel over the eyes and forehead; we also, at times, when the heat is very depressing, apply a wet towel over the region of the heart and the feet. Sinuses are not uncovered to the sun until the insolation of the rest of the body is complete. Then the dressings are removed and replaced by wire screens which keep off the flies and still allows free irradiation of the part.

A rub with vegetable oil often, after each treatment, helps to the comfort of the patient and tends to promote a healthy condition of the skin. While this rub is desirable, it is not necessary.

The following is our modification of Rollier's technique:

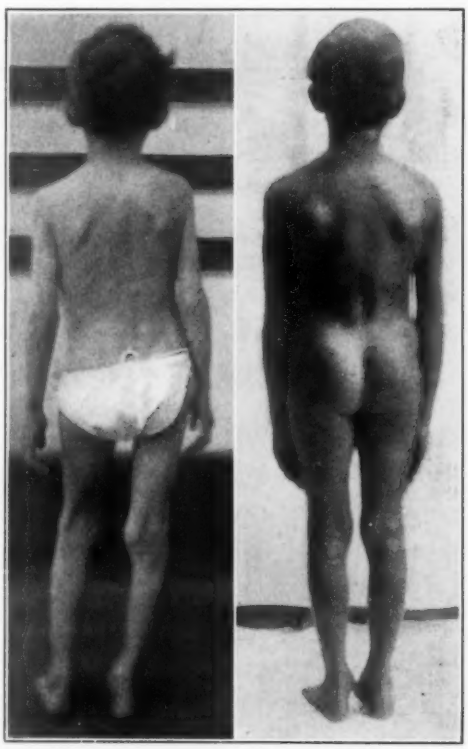
First day: The patient, reclining on a bed and dressed only in trunks and with head and eyes protected, is taken to the sun porch where neither glass nor screen comes between the patient and the sun. His body is covered with sheets or blankets down to the feet, which are exposed and insolated for periods of five minutes, three times during the day with intervals of about an hour.

Second day: Each insolation period of the feet is increased to ten minutes, and during the last five minutes of each period the sheets are drawn back to the knees, thus giving the feet ten minutes and the legs from ankle to knee three five-minute exposures.

Third day: The feet are irradiated for fifteen minutes at each period. The insolation time of the part from ankles to knees is increased to ten minutes, and during the last five minutes the thighs are exposed and insolated.

Fourth day: Each of the three insolation periods is as follows: feet, 20 minutes; ankles to knees, 15 minutes; thighs, 10 minutes; abdomen, 5 minutes.

Fifth day: Each insolation period of each part previously irradiated is in-



Case No. 3007
Tuberculosis of Spine
Entrance
(5th and 6th Thoracic, 1st and 2nd Lumbar.)
Three Years Later

creased by five minutes, and the chest receives its initial exposure of five minutes each period.

This daily increase in the length of the irradiation periods is kept up until on the twelfth day the longest-exposed part receives a total of three hours, the exposure periods being: for the feet, 60 minutes; ankles to knees, 55 minutes; thighs, 50 minutes; abdomen, 45 minutes, and chest, 40 minutes. From this day on to the sixteenth, the insolation period of the feet remains 60 minutes while that of the other parts keeps increasing at the same rate until the 60-minute limit is reached by each one in turn. On the seventeenth day the change is made from three 60-minute periods to two 90-minute periods, one in the morning and another in the afternoon. If this length of insolation is contraindicated because of poor general condition, fever, very sensitive skin, etc., the time may be shortened. On the other hand, if the indications warrant, it may be increased to four hours by slow progression. The anterior and posterior surfaces should, if possible, receive the same amount of irradiation, the total exposure being divided equally between the two surfaces. In certain instances where the patient, either because of pain or general physical condition, cannot be turned to permit irradiation of the posterior surface, the anterior surface alone is insolated until improvement in the physical condition will permit the turning of the body—when the procedure otulined above is repeated.

When the sun cure is applied according to this schedule of cautiously increased dosage the patient's skin does not burn, but begins at once to acquire a healthy tan. With some complexions the pigmentation keeps on increasing until it becomes a chocolate brown. In others the maximum depth of color is not so great. The texture of the skin in both types improves and becomes remarkably supple, velvety and free from blemishes. Cases that have shown more difficulty in tanning have been those with a normally freckled skin, who burn readily with exposure to sun. This reaction usually goes with a skin which is apparently delicate and of very fine texture, found on certain blonde types. This type usually burns easily and the sun seems to make the patient very irritable. In such cases special precaution is usually taken to insolate them very slowly and with very small doses. Dr. Rollier apparently assumes that the favorable progress of the cure is in direct proportion to the intensity of the pigmentation. While this may be true in a majority of instances, it proves misleading in some cases. Take on the one hand the patient in whom a very fair skin is a racial characteristic—and in the other extreme, the negro, with his naturally deep pigmentation. In both these cases a comparatively slight change in the depth of color may be accompanied by a very marked improvement in physical condition. Hence, it would seem more logical to take as an index to prognosis the comparison between the amount of pigmentation acquired by a patient and the ultimate pig-

menting capability of his type.

The local beneficial effect of heliotherapy does not stop with the skin, but extends to the muscles underneath. Visitors to our institution are amazed that patients, who take little or no exercise should show such muscle development. We are inclined to attribute at least a

Diagnosis	Total	Apparently Recovered	Arrested	Improved	Unimproved	Dead
TB of Lymph Nodes	433 or 46.3%	332 or 81.3%	44 or 10.7%	26 or 6.7%	6 or 1.33%	5 or 1.15%
TB of Peritoneum	102 or 13.9%	79 or 77.4%	14 or 13.7%	2 or 1.9%	7 or 6.9%	
TB of Spine	75 or 8.5%	28 or 37.3%	21 or 28%	9 or 12.%	13 or 17.3%	4 or 5.3%
TB of Hip	50 or 5.3%	37 or 75.5%	15 or 11.7%	7 or 14.7%	4 or 8%	2 or 2.5%
TB of Sacro-iliac Joint	6 or 64%	3 or 50%	2 or 33.3%		1 or 16.6%	
TB of Knee	49 or 5.5%	22 or 52.4%	12 or 28.5%	4 or 9.5%	2 or 4.7%	2 or 4.7%
TB of Ankle and Foot	28 or 3.1%	21 or 75.%	5 or 17.8%	2 or 7.1%		
TB of Wrist and Hand	28 or 3.1%	20 or 71.4%	6 or 21.4%	1 or 3.6%		1 or 3.6%
TB of Humerus	1 or .1%		1 or 100.%			
TB of Femur	5 or 5%	2 or 44.%	2 or 40%	1 or 20%		
TB of Ischium	1 or 1%	1 or 100.%				
TB of Sternum	3 or .3%	2 or 66.6%	1 or 33.3%			
TB of Kidney	34 or 3.6%	7 or 20.6%	16 or 47.%	7 or 20.6%	3 or 8.8%	1 or 2.9%
TB of Epididymis	13 or 1.3%	6 or 46.1%	5 or 38.4%	2 or 15.4%		
TB of Eye	21 or 2.2%	19 or 90.5%	1 or 4.7%		1 or 4.7%	
TB of Jaw	1 or 1%	1 or 100%				
TB of Shoulder	7 or .7%	2 or 28.5%	5 or 71.5%			
TB of Elbow	11 or 1.1%	7 or 63.5%	4 or 36.5%			
TB of Sacrum	1 or .1%	1 or 100.%				
TB of Phalanges	12 or 1.3%	12 or 100%				
Osteomyelitis (non TB)	26 or 2.7%	13 or 50.%	7 or 26.9%	6 or 23.1%		
Lupus and TB Ulcers	5 or .5%	4 or 80.%	1 or 20.%			
Total	935 or 100.%	554 or 59.%	162 or 17.3%	67 or 7.1%	36 or 3.8%	16 or 1.8%

Note: The above chart does not include 49 cases of pyo pneumothorax and 98 cases of pleurisy with effusion. Results of treatment of cases that were discharged from J. N. Adam Memorial Hospital up to January, 1925, and who remained in the institution three months or longer.

share of this muscle development to the action of the moving air upon the body which we have repeatedly emphasized as an integral part of heliotherapy.

But it is in the patient's general condition that solar irradiation effects the most gratifying improvement. His temperature gradually returns to normal, weight and strength are taken on, pain is alleviated and then disappears; both the hemoglobin and red cells of the blood increase; leucocytosis, if present, becomes reduced and an actual lymphocytosis takes place. Even the disposition also improves and to the patient's own surprise, he finds himself facing life with an optimistic attitude.

The outstanding local result in the not too advanced cases of joint tuberculosis is the gradual restoration of function, partial and complete, in the affected joint; whereas, in the ordinary expectant treatment with casts, or by operative procedure, the prognosis depends upon the completeness of the ankylosis. In heliotherapy, the aim is to restore the full function of the joint.

The action of the sun upon tuberculous tissue is one of repair. It appears to increase the rate of disintegration of cells damaged beyond repair, while stimulating the activity of those which are undamaged. This is shown by an increase at first in the amount of exudate from sinuses and ulcers accompanied frequently with swelling, edema and induration of the surrounding parts. This is followed by the subsidence of the swelling, the gradual diminution of exudate, the formation of healthy granulation tissue and a subsequent healing.

The action of the sun upon bone tissue is one of recalcification and spontaneous expulsion of sequestra.

The effect upon lymph nodes is one of gradual shrinkage with fibrosis—and in broken-down glands, very often one of absorption or recalcification.

The effect on effusions is one of absorption. This is best noticed in peritonitis and pleurisy with effusion.

Abscesses may at first become larger, but are gradually absorbed or become calcified.

Sinuses at first react, as shown by profuse discharge and sloughing, but this is followed by the formation of healthy granulations and the gradual drying up and healing of the sinus.

When Dr. Rollier placed the weight of his condemnation upon all surgical measures except aspiration, in the treatment of so-called surgical tuberculosis, he was undoubtedly diverting opinion along this line into newer and better channels. And yet, we cannot but think that in order to give our patients the best possible service, it is sometimes advisable to resort to surgery. It has been repeatedly observed that the removal of a sequestra of bone in osteomyeltis has really hastened the healing of a sinus. And then it cannot be denied that operative procedures are necessary in correcting deformities that came about before sun treatment was applied or whch could not be prevented during the treatment. While we favor some surgical interfer-

J. N. ADAM MEMORIAL HOSPITAL

No. _____ *Name* _____

Date																	
Days	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th
	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	T.I.D	B.I.D.
					5 Min.	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	45 Min.	50 Min.	55 Min.	60 Min.	
				5 Min.	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	45 Min.	50 Min.	55 Min.	60 Min.	60 Min.	
			5 Min.	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	45 Min.	50 Min.	55 Min.	60 Min.	60 Min.	60 Min.	
		5 Min.	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	45 Min.	50 Min.	55 Min.	60 Min.	60 Min.	60 Min.	60 Min.	
	5 Min.	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	45 Min.	50 Min.	55 Min.	60 Min.	60 Min.	60 Min.	60 Min.	60 Min.	
Total Daily Exposure of part exposed longest	15 Min.	30 Min.	45 Min.	60 Min.	75 Min.	90 Min.	105 Min.	120 Min.	150 Min.	150 Min.	165 Min.	180 Min.	180 Min.	180 Min.	180 Min.	180 Min.	

The amount of exposure, from this day on, is the same except that the periods are divided into a morning and an afternoon period of 90 min. each.

THESE EXPOSURES ARE TO BE DIVIDED EQUALLY FOR ANTERIOR AND POSTERIOR SURFACES WHENEVER POSSIBLE

Time for the above Exposures																	
A.M.	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45	8:45
A.M.	9:50	9:55	10:00	10:05	10:10	10:15	10:20	10:25	10:30	10:35	10:40	10:45	10:45	10:45	10:45	10:45	
P.M.	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15	3:15

MODIFICATION OF ROLLIER'S SCHEMATIC DIAGRAM OF INSOLATION

ence, such operations should be delayed until the patient's general condition has been well built up by a course of sun cure. To use the knife at a stage when the disease is active and when the patient's physical condition is poor, is, indeed, imprudent and dangerous. Sometimes the patient's response to heliotherapy is so far beyond expectations that the contemplated operation is found to be unnecessary.

Up to January 1, 1926, there have been discharged from the J. N. Adam Memorial Hospital 1,034 patients who presented some form of extra pulmonary tuberculosis or other condition for which heliotherapy was applied and who remained in the institution three months or longer. Of the cases,

468 or 45.3% were tuberculosis of the lymph nodes.
107 or 10.4% were tuberculosis of the peritoneum.
324 or 31.3% were tuberculosis of bone and joints.
33 or 3.2% were osteomyelitis (non t. b.)
42 or 4 % were tuberculosis of the kidneys.
13 or 1.2% were tuberculosis of the epididymis.
21 or 2 % were tuberculosis of the eyes.
5 or .5% were tuberculosis of the skin.
15 or 1.5% were empyema.

Of the 468 cases of tuberculosis of the lymph nodes,

381 or 81.4% were discharged as apparently recov'd
48 or 10.2% were discharged as arrested.
28 or 6 % were discharged as improved.
6 or 1.3% were discharged as unimproved.
5 or 1.1% were discharged as dead.

Of the 107 cases of tuberculosis of the peritoneum,

82 or 76.6% were discharged as apparently recov'd.
14 or 13.1% were discharged as arrested.
3 or 2.8% were discharged as improved.
8 or 7.5% were discharged as unimproved.

Of the 324 cases of tuberculosis of the bone and joints,

182 or 56.3% were discharged as apparently recov'd
80 or 24.6% were discharged as arrested.
30 or 9.2% were discharged as improved.
22 or 6.8% were discharged as unimproved.
10 or 3 % were discharged as dead.

Of the 42 cases of tuberculosis of the kidneys,

9 or 21.4% were discharged as apparently recov'd.
18 or 42.7% were discharged as arrested.
10 or 23.8% were discharged as improved.
4 or 9.5% were discharged as unimproved.
1 or 2.4% were discharged as dead.

Of the 33 cases of osteomyelitis (non t. b.),

15 or 45.5% were discharged as apparently recov'd.
9 or 27.2% were discharged as arrested.
9 or 27.2% were discharged as improved.

Of the 13 cases of tuberculosis of the epididymis,

6 or 46.1% were discharged as apparently recov'd.
5 or 38.4% were discharged as arrested.
1 or 15.5% were discharged as improved.

Of the 21 cases of tuberculosis of the eyes,

19 or 90.5% were discharged as apparently recov'd.
1 or 4.7% were discharged as arrested.
1 or 4.7% were discharged as improved.

Of the 5 cases of tuberculosis of the skin,

4 or 80% were discharged as apparently recov'd.
1 or 20% were discharged as arrested.

Of the 15 cases of empyema,

7 or 46.6% were discharged as apparently recov'd.
6 or 40 % were discharged as improved.
1 or 6.7% were discharged as unimproved.
1 or 6.7% were discharged as dead.

The above figures do not include 50 cases of pyopneumothorax and 115 cases of pleurisy with effusion complicating either pulmonary or surgical tuberculosis that were treated with solar radiation. The results in these cases, espe-

cially where the pulmonary lesion was not severe, were most gratifying.

Of the number that died, the cause of death of three was influenza during the epidemic, while in one case a psoas abscess ruptured into the intestines causing death in a few days. The remainder were cases of several years standing with advanced pulmonary tuberculosis.

Fourteen per cent of the adults and 21 per cent of the children discharged had multiple lesions.

Fifty per cent of the adults and 27 per cent of the children had had surgical interference.

Seventy-six per cent of all the joint cases were discharged with partial or full motion.

Sixty-nine per cent of the adults and 16 per cent of the children had a diagnosable pulmonary lesion.

The average duration of illness before admission was about two and one-half years.

No case that has been confined to bed is discharged as apparently recovered until he has been up and about for at least six months if the lesion is in the bone or joint, or three months in case of other lesions. As a rule, no bone or joint case becomes ambulant until x ray examination shows good repair, all signs and symptoms have disappeared, sinuses and ulcers are healed and abscesses have been absorbed or calcified. The patient being in this favorable condition and feeling correspondingly well, the three to six months probation period taxes his patience to the utmost and in all too many cases, he is induced by his restlessness to leave the institution before the proper time with the result that our percentage of apparent recoveries is appreciably reduced.

Incited by the success and growing popularity of sun-cure, various manufacturers have sought to reap a rich harvest bp placing on the market certain lamps which are purported to serve as substitutes for solar energy. We need only call attention to the following facts: Lamp treatments are usually given in ill-ventilated and stuffy rooms where the air is stagnant; many of the lamps give off injurious gases and oxides; the pa tients thus treated, not being under a hospital regimen, engage between treatments in activities that serve to undo any good that may have been accomplished —and thinking persons must be convinced that such means should not be considered when natural sunlight is available. In the hands of the conscientious and well-informed practitioner these lamps have a certain limited value; used indiscriminately, they are a menace, wasting the patient's time and money and buoying him up with false hopes until his chances are gone.

In our institutional work we find a sphere of usefulness for artificial lights inasmuch as there is a rather long season of the year in these northern regions in which very little sun cure can be given. These lamp irradiations used in conjunction with the regulation sanatorium treatment effect a measure of improve-

ment and keep up the morale of the patient during the winter months.

There are many different types of lamp modification of the carbon arc, the mercury arc, and the incandescent—but we prefer a kind that produces a light most nearly resembling natural sunlight both in intensity and spectral distribution because experience has shown us that the results obtained by natural sunlight have not in any way been equaled by those obtained by any artificial light on the market today. Dr. Brian O'Brien, physicist at the J. N. Adam Memorial Hospital, has given us an arc lamp imitating the sun both in intensity and spectral distribution, but the mechanical difficulties encountered have been so great that it has been impossible to place this lamp on the market. But even with a lamp that will give us the same spectral distribution and intensity as the sun when it reaches us, it is difficult to use it under the same air conditions that we do the sun treatment.

As to the mercury arc we cannot begin to show the enthusiasm for it that some have professed to feel. It is true that it is especially rich in ultra violet rays, but it is deficient on other portions of the spectrum and we believe, from our experience, that each part of the spectrum has its part to play, and while the mercury vapor lamp is useful in certain superficial lesions, it is inferior for general irradiation.

In recent years solar energy has been attaining wide recognition in the treatment of anemia, puerperal sepsis, osteomyelitis, neuritis and in the convalescence from all wasting and infectious diseases. It has been definitely proven that it has a specific value in rickets. In the light of the past it is to be hoped and expected that the time will soon come when each community will have in an easily accesible suburb, an institution to which a patient may be sent to share in the healing and invigorating influence of sunshine and fresh air.

In these days when preventive medicine is coming so rapidly to the fore it should not be hard to convince both the medical profession and the general public that the prophylactic powers of the sun should be utilized to the greatest possible extent by promoting open-air schools and playgrounds, and out-of-door environment—places for both young and old, but the profession must lead the way and if we can induce physicians to lift up their eyes from the concoction of pills and nostrums—and the cult, of the scalpel, and to see the great possibilities that are ever present in the powerful agencies of the sun and air, we shall consider that we have done our bit.

In conclusion, I wish to emphasize the following points:

1. Tuberculosis, being a systemic disease as shown by our present knowledge of its etiology, portal of entry and dissemination, must be treated by measures that affect the general system—and not the local manifestations.

2. Surgical measures are a drain upon the body vitality, thus tending towards a reactivation or aggravation of the dis-

ease, hence, it cannot be looked upon with favor.

3. Operative procedure in an attempt to remove the localized disease area, tends to break down the wall of granulation and connective tissue, which is naturally the bulwark against disease, thus opening up new areas to infection and increasing the possibility of a generalized tuberculosis; meanwhile, the primary cause is untouched.

4. Operative procedure in joint tuberculosis favors ankylosis and thus destroys joint function, whereas heliotherapy favors its preservation or restoration.

5. Operative procedure is justified only (a) in those cases in which, in spite of heliotherapy and the resulting good general physical condition, the local lesion has not shown any satisfactory improvement; (b) to correct deformities developed during the course of treatment in spite of all efforts to prevent them; (c) to provide stability by an arthrodesis in a flail and useless articulation; (d) to evacuate abscesses, and this only by aspiration or a small incision when the pus is very thick; (e) in unilateral renal tuberculosis with marked destruction.

6. Solar radiation is a great muscle developer as seen in the perfect musculature of those cases who have been in bed for years, hence, a very important factor in maintaining good positions and in preventing the development of deformity when the patient is up and about and convalescing. The long-continued use of casts for immobilization leads to the abolition of function through atrophic degeneration or specialized structures.

7. During the summer the irradiation period should be begun as early in the morning as the problems of hospital management will allow and if not completed at this time, it should be continued as late in the afternoon as the sun will permit so as to avoid the most intense heat and thus reduce the possibility of complications; and in cold seasons, the sun exposure should be given at the middle of the day when the temperature of the air most nearly approaches the point of comfort, the utmost care being exercised to prevent cold breezes striking the body.

RESULTS OF TREATMENT OF CASES THAT WERE DISCHAGED FROM THE J. N. ADAM MEMORIAL HOSPITAL UP TO JAN. 1, 1926, AND WHO REMAINED IN THE INSTITUTION THREE MONTHS OR LONGER

DIAGNOSIS	Total	Apparently Recovered	Arrested	Improved	Unimproved	Dead
Tb. of Lymph Nodes	468 or 45.3%	381 or 81.4%	48 or 10.2%	28 or 6.0%	6 or 1.3%	5 or 1.1%
Tb. of Peritoneum	107 or 10.4%	82 or 76.6%	14 or 13.1%	3 or 2.8%	8 or 7.5%	
Tb. of Bone and Joints	324 or 31.3%	182 or 56.3%	80 or 24.6%	30 or 9.2%	22 or 6.8%	10 or 3.0%
Tb. of Kidneys	42 or 4.0%	9 or 21.4%	18 or 42.7%	10 or 23.8%	4 or 9.5%	1 or 2.4%
Osteomyelitis (Non Tb.)	33 or 3.2%	15 or 45.5%	9 or 27.2%	9 or 27.2%		
Tb. of Epididymis	13 or 1.2%	6 or 46.1%	5 or 38.4%	2 or 15.5%		
Tb. of Eyes	21 or 2.0%	19 or 90.5%	1 or 4.7%		1 or 4.7%	
Tb. of Skin	5 or 0.5%	4 or 80 %	1 or 20.0%			
Empyema	15 or 1.5%	7 or 46.6%		6 or 40.0%	1 or 6.7%	1 or 6.7%

Note: The above figures do not include 50 cases of pyopneumothorax and 115 cases of pleurisy with effusion complicating either pulmonary or surgical tuberculosis that were treated with solar radiation. The results in these cases, especially where the pulmonary lesion was not severe, were most gratifying.

RESULTS OF TREATMENT OF CASES THAT WERE DISCHARGED FROM THE J. N. ADAM MEMORIAL HOSPITAL UP TO JAN 1, 1926, AND WHO REMAINED IN THE INSTITUTION THREE MONTHS OR LONGER

DIAGNOSIS	Total	Apparent Recovery	Arrested	Improved	Unimproved	Dead
Tb. of Lymph Nodes	468 or 45.3%	381 or 81.4%	48 or 10.2%	28 or 6 %	6 or 1.3%	5 or 1 %
Tb. of Peritoneum	107 or 10.4%	82 or 76.6%	14 or 13.1%	3 or 2.8%	8 or 7.5%	
Tb. of Spine	81 or 7.8%	30 or 37.1%	23 or 28.4%	11 or 13.6%	13 or 16. %	4 or 4.9%
Tb. of Hip	87 or 8.4%	53 or 59.5%	17 or 19.5%	10 or 12 %	5 or 5.7%	2 or 2.3%
Tb. of Sacro-Iliac Joint	6 or .6%	3 or 50. %	2 or 33.3%			1 or 16.7%
Tb. of Knee	47 or 4.5%	26 or 55.3%	12 or 25.5%	4 or 8.5%	3 or 6.3%	2 or 4.3%
Tb. of Ankle and Foot	30 or 2.9%	22 or 73.4%	6 or 20. %	2 or 6.6%		
Tb. of Wrist and Hand	29 or 2.8%	20 or 69. %	6 or 20.7%	1 or 2.4%	1 or 2.4%	1 or 2.4%
Tb. of Humerus	1 or .09%		1 or 100 %			
Tb. of Femur	5 or .5%	2 or 40. %	2 or 40 %	1 or 20 %		
Tb. of Ischium	1 or .09%	1 or 100 %				
Tb. of Sternum	3 or .29%	2 or 66.6%	1 or 33.3%			
Tb. of Kidneys	42 or 4. %	9 or 21.4%	18 or 42.7%	10 or 23.8%	4 or 9.5%	1 or 2.4%
Tb. of Epididymis	13 or 1.2%	6 or 46.1%	5 or 38.4%	2 or 15.5%		
Tb. of Eyes	21 or 2 %	19 or 90.5%	1 or 4.7%		1 or 4.7%	
Tb. of Jaw	1 or .09%	1 or 100 %				
Tb. of Shoulder	9 or .87%	2 or 22.2%	6 or 66.6%	1 or 11.1%		
Tb. of Elbow	11 or 1. %	7 or 63.6%	4 or 36.4%			
Tb. of Sacrum	1 or .09%	1 or 100 %				
Tb. of Phalanges	12 or 1.2%	12 or 100 %				
Osteomyelitis (Non Tb.)	33 or 3.2%	15 or 45.5%	9 or 27.2%	9 or 27.2%		
Lupus and Tb. Ulcers	5 or .5%	4 or 80. %	1 or 20 %			
Empyema	15 or 1.5%	7 or 46.6%		6 or 40 %	1 or 6.7%	1 or 6.7%
Perthe's Disease	1 or .09%	1 or 100 %				
Rickets	5 or .5%	5 or 100 %				
TOTAL	1034 or 100 %	711 or 68.8%	176 or 17.0%	88 or 8.5%	42 or 4.0%	17 or 1.6%

DIATHERMY TREATMENT OF NERVOUS DISEASES*

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THE favorable effect of warmth on nervous troubles, which is corresponding to the practical experience of many centuries, induced from the very beginning of the diathermic era physicians to make use of diathermy in nervous diseases. In this territory of physical treatments just as in the other territories of treatment, much is still in a stage of development, yet from many sides so good results have been reported in different nervous diseases, that it seems useful to give a short view of this territory.

Before entering into the clinical investigation it seems necessary to say a few words about the high frequency currents to be applied; for, in order to have good results, it is absolutely necessary to apply the right technic. This seems the more important, for by the different methods of application we can make use of the the high frequency oscillations in different ways, which are able to produce even opposite effects. Even though we

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apply the same method we can produce different effects by applying them to different parts of the body. To avoid obscurities and repetitions, I may anticipate the following data:

We understand by *diathermic* treatment the application of high frequency currents which are delivered by diathermy apparatus and which are applied to the patient by direct bi-polar connection by means of metal contact electrodes. This application can be used locally or for general treatment.

The application can be made by means of great condenser plates, equal bipolarly—that means not by contact, at least for one electrode—to the whole body, or to greater parts of it, so to say, in an indirect way. (Condensation-couch.)

Glass-condenser electrodes (vacuum or graphite filling) at one pole with a metal contact-electrode to the other—i. e. bipolar—can be applied.

The treatment can be done indirectly in a solenoid. We make use of the great solenoid for the whole body, of smaller solenoids for the head or arms.

Totally different from these diathermic applications is the application of high-frequency currents of very high tension and low intensity by means of effluves or sparks.

If in the following we are making technical statements:

Technic 1 means metal or water contact electrode.

Technic 2 means condenser couch.

Technic 3 means condenser electrodes.

Technic 4 means big or small solenoid.

Technic 5 means high frequency douche or sparks.

Each has its specific duty to perform:

1. Metal or water electrodes produce primarily deep diathermic heating, further secondary actions as hyperemia, hyperlymphia, hypersecretion and other secondary effects and have a sedative pain soothing action.

2. The condenser-couch raises the whole body temperature, increases the metabolism and has a sedative action on the nervous system.

3. Condenser electrodes relieve hyperalgesias, remove hypoalgesies and anesthesias, have a toneifying action and raise the blood pressure.

4. The solenoid acts sedatively and lowers the blood pressure.

5. High frequency douche and sparks are strong skin irritants, have a pain-soothing action and the latter produce muscle contractions.

Let us now proceed to the clinical investigation and begin with neuralgias. Here like everywhere in medicine, the diagnosis is the greatest importance, for on it depends the technic to be applied. So we have to separate, if possible, the neuritis from neuralgia and from the latter the reflex-neuroses. For it is clear that, if we have, for instance, to deal with a sciatica, which comes from an arthritis in one of the upper lumbar vertebrae or with an occipital neuralgia coming from an arthritis deformans of a neck vertebral joint or from an atypical neck rib or from an inflammation of the

sphenoidal cave, then the treatment of the painful lesion must necessarily be without any effect, and then one speaks of the inefficiency of diathermy in sciatica, etc. I have further seen cases of sciatica, in which a carcinoma of a pelvic bone or a beginning undiagnosed tabes was present. Many neuralgias in women are coming from exudations or infiltrations in the pelvis, pelvical phlebitis or hemorrhage. So shoulder or arm neuralgias are occasionally angina pectoris or bursitis subdeltoidea.

It would lead too far to enumerate all possibilities of false diagnosis; it is sufficient to indicate this point energetically.

If the diagnosis sciatica is certain the question arises, which technic we should apply. Many authors recommend placing the patient on his stomach and putting one electrode of great surface on the buttock, another one on the calf or a cuff-electrode to the leg. This technic is absolutely wrong. Namely, if we do so, the whole current will choose the way of smallest resistance, that is, through the big blood vessels, and the relatively bad conductive nerve receives nearly nothing. Not more to be recommended is the technic of Kowarschik, who lies the patient on the back, puts a big plate under the buttock, a circular electrode around the lower leg and connects both plates to one pole. The second pole is conducted to a ring-electrode above the knee and now the diathermic current distributes from this knee plate to both of the others. Here too, the chance is small that diathermy will reach the nerve in a somewhat sufficient intensity.

This can only be done by Technic No. 1; if the patient is lying on his stomach, one electrode of about 200 square cm. surface and oblong form (about 10x20 cm.) is applied under the stomach and now a stiff metal electrode, which cannot be easily bent, of much smaller size (about 6x10 cm.) is impressed at different points of the sciatic nerve into the muscular tissue beginning at the roots of the nerve and going down along the course of the nerve. Herewith the indifferent electrode of course has to be removed from the stomach, and, in the measure the small electrode goes down the leg, has to be applied farther down, so that it is situated at the thigh and latter at the lower leg, always diametrically opposed to the active sciatic electrode. In that way the nerve is always situated on the way of the current and as near as possible to the active electrode. Of course the electrode is not to be fixed by bandage, but an experienced assistant, who knows exactly the anatomy, must always hold the active electrode with strong pressure and control its right position as well as he has to move properly the indifferent electrode. The intensity of the current is sufficient with one ampere; the duration of the treatment is at least ten minutes for each place. Herewith the treatment of sciatica is by no means finished; now comes a very important other application. Very often after this first treatment pains are very little relieved or would come back after a short time. There are very often

reflex pain contractures present and these must be removed by energetic mechanic intervention. For this purpose I apply the condenser-electrode of thick glass with graphite filling (Technic 3). This electrode worked with a certain tension (3,000 to 5,000 volts) and very small not measurable intensity in bipolar application kneads with very energetic massage the total of the muscles innervated by the sciatic nerve, the patient's muscles being as much as possible relaxed, lying in an easy position. The patient generally is relieved herewith and I have seen many cases which after one single treatment of this combination have been cured. Generally, in fact, one needs several treatments, but very often after the first two or three treatments the patients are indeed very much improved. Even cases of several years' standing have been cured by this method in a very short time. If there is no good result one can be sure that the cause of the malady is situated somewhere else, for instance pelvic phlebitis in ladies near the climacteric, or bone bridge between two vertebrae or any kind of pressure on the nerve roots or its trunk, like fibroma, etc.

The same for the brachial, occipital and some other neuralgias.

It is different with the trigeminus neuralgia. Here I never have seen a result by diathermy application by means of plates; even doubtless aggravations generally have occurred. I came, therefore, to the conviction that the trigeminus neuralgia is always a pure reflex-neurosis, in which the reflex irritation is produced in the skin or in the mucous membrance. If in such a patient one examines and inquires exactly, one finds in all, that he states, that, if he drinks one swallow and herewith makes a sipping movement, immediately an attack occurs; or blowing the nose, touching one hair of the mustache, of an eyelash, closing the eyes, movements of the mouth in speaking, etc., produce an attack. Or one finds, when the patient does not know the cause, where the attacks come from, that inside of the nose, at the bottom of the nasal cavity or at the septum or at the margin of the ala nasae, or at the palate behind the incisive teeth, at the side wall of the tongue, at any place on the gums or somewhere else on the mucous membrane of the oro-nasal cavity that there is an area of several, often of very small size and circumscribed, which, if touched very lightly by a piece of cotton wool, produces an attack. I therefore have already more than fifteen years ago recommended the following method, which I have found the most effective, which we dispose of altogether in this nearly inaccessible suffering:

The patient takes one metal electrode in one or both hands; a very thin pointed glass vaccum electrode is connected to the other pole. With this electrode you sweep gently over the whole territory of the nerve of the skin of the face, in the ear, in the mouth and the nose and in the pharynx centimeter by centimeter. If one finds a spot from which by touching, an attack is produced, it is sometimes not possible from the start to treat this place. In this case one goes first around that place, approaching slowly

and tries to touch very gently with the electrode. If the patient has stood just for a moment the contact of the electrode, so the game is won and now you keep the electrode steady here without pressure on that place; then after about 30 seconds you can generally press harder and move to and fro without producing an attack and without the patient having any painful sensation. In that way one tries the whole surface inch by inch. It is so seldom that tenderness in one place has become painless, jumps over to another one, which before was not sensitive or jumps back again. Then one ought not to be impatient and must try again and again. In severe cases such a treatment sometimes takes two to three hours; and in the beginning occasionally the treatment must be done twice a day if the attacks follow each other quickly. But these are exceptions and generally improvement begins from the very first treatment. Patients very often state during treatment that in themselves like a tension loosens itself and that they suddenly feel free, especially when one has detected such a painful point and has applied electrodes some seconds to it. The effect of the current is sometimes very striking. While the touch by the electrode, if no current is switched on, is very painful and produces an attack, this is not the case as soon as the current passes, and this is after my opinion a striking proof for the efficiency of the method. In light cases, where often there is only one single tender point of the skin, generally the edge of one wing of the nose or at the emergence of the supraorbital nerve, sometimes one single treatment of a few minutes' duration is sufficient to produce healing. In other cases improvement is started very soon, the attacks become much more seldom and less severe; but for a long time continuously recurrences occur and one has to treat for months. This, however, is rare and the quick improvements are preponderating. I am inclined to believe, that apart from such cases, in which a retained molar or a chronic purulent pulpitis or periostitis of the jaw is the cause—of these cases we do not speak here—the reflex neurosis is mostly a psychogenic one and often connected to the sexual life. Therefore the frequent recurrences, even after a quickly effective treatment. I believe that I may recommend you this treatment in all cases of genuine so-called trigeminus neuralgia. It is quicker, simpler, harmless, and much more effective than any other one, even as x ray and injection treatment. I may state that cases that have already been treated by alcohol injections are more difficult to influence.

Other neuralgias, like intercostal neuralgia for instance, are less fit for this treatment as it does not hit the inflamed spinal ganglion; however, here too improvement and shortening of the course of the disease is produced.

In real neuritis I discourage any mechanical treatment. Putting the organs to rest and x ray therapy are here indicated, besides radiant heat.

In polyneuritis general diathermy on the condenser couch can be of use.

In peripherial paralysis diathermy is important as combination treatment with electrorhythmic. The warming of the paralyzed muscles by plate diathermy (Technic 1) makes them hyperemic and activates the metabolism of the diseased muscle fibre.

Migrane, which also is to be regarded as a reflex disease, generally reacts splendidly on treatment by the condenser electrode. Here I generally apply the graphite electrode. One mostly observes immediate stopping of the attack. Pain, nausea, vomiting, glimmering before the eyes, cease regularly in the first treatment. More than five treatments of ten minutes duration are sldom necessary to produce healing of long duration. Occasionally, recurrences after months or years react again just as well.

Further the symptom "headache" is a successful field for this diathermy treatment. Headache from fever as well as chronic inflammations (for instance sinus catarrh) or headache from stomach or intestinal diseases do not react. But I have seen numerous cases of essential headache of many years' standing which healed in a short time definitely by this treatment.

Many other cases like tarsalgia, coccygodynia, tooth neuralgia and others, in which the symptom pain is present without us being able to determine an ethological factor, can be healed quickly, well and definitely by combined plate and condenser diathermy treatment.

Let us proceed to the central nervous diseases. There we have to enter rather closely into tabes. Although we are not in doubt about the central and degenerative nature of this disease, I am convinced that some symptoms of this disease are only indirectly connected to its central cause and that they are much more due to troubles in the function of the autonomous system, which, too, explains their incalcuble and crisis-like occurrence. This gives us the possibility to influence therapeutically by high frequency currents and so to improve very much many symptoms in spite of the persistence even the progress of the central disease. Here the high frequency douche is the essential therapeutical factor and one of enormous efficiency. It is of no use at all to apply plate diathermy to the vertebral spine. Only strong and local douche treatment to the periphery is of value. As the skin is the chief reflectory organ for this therapy, it is recommended to extend the douche treatment to the whole thorax too, which moreover produces a great improvement of the general feeling a tonization and a refreshment of the patient.

One covers by the douche electrode all the territory where the shooting pains, paraesthesias, hyperaesthesias, hyperalgesias are present, connecting the other pole of the high frequency machine to a handle electrode. The current is dosed by approaching or removing the douche electrode. Monopolar application is of little or no effect. Immediately after treatment the lancinating pain in some cases has disappeared, but generally the effect is more distinct three to four hours later. The attacks become less severe, more seldom stop altogether. Corres-

ponding to the variable course of the whole tabes disease one sometimes sees patients absolutely free of pain after the very first treatment. In other cases the treatment has to be carried on for a longer time and to be repeated from three to four times a year; again in other cases shorter intervals are necessary. But in most cases patients are kept completely free of pain or sometimes after the cure very small indications of shooting pains begin again and that is a sign that the treatment has to be repeated. If one waits longer, the attacks become by and by more intense, while if one considers these light premonitory symptoms patients remain constantly free from any heavier pain. Morphinism impedes. Morphinists react more difficult to the treatment, but often patients who are still moderate in the use of narcotics can be completely disaccustomed. Hyperalgesias afford a somewhat different treatment. They are generally stationary, remain for hours or days at the same place. One begins here with diathermic plate electrodes to both sides of the painful skin area, because the immediate direct touch is too painful. Hereby after some minutes the sensitiveness is so far reduced that now the plate can be directly applied to the painful place and in a few minutes the patient is relieved. The attacks become more seldom, shorter and easier, and herewith it is often possible to keep the patients mostly free of pain.

It is the same in crises gastric, bladder, intestinal, vulva, etc. They mostly react best on combined treatment by douche and plate electrodes. Especially the sensation of tenesmus answers quickly on high frequency treatment. That here no suggestive effects are present is best seen in the improvement of incontinence, which is generally present and can be observed objectively. I have observed patients with 400 c.c. residual urine, who after a series of treatments were able to empty their bladder totally and remain for years in this state. The sensibility of the sphincter does not return indeed, but the tonus of the bladder is re-established by bipolar intravesical treatment so far, that patients, if they regularly empty their bladder every three hours (including night) lost practically their incontinence completely notwithstanding that they further neither felt the impulse to urinate. The same is with emptying the bowels, where the treatment has to be made by bipolar intrarectal application.

On the sensitive troubles the sensation of colds and the numb feeling, especially at the sole of the feet, react best to the high frequency douche. Here sometimes occurs a certain dissociation of feelings. While the pain sensation for needle pricks and the distinction of cold and warm are further missing, very soon a sensitiveness for fine touch returns and herewith stops the feeling, as if they walk on rubber, and the numbness. Patients mostly make these remarks spontaneously. Correspondingly a marked improvement of ataxia is noted and this high frequency treatment is an important aid in the exercising therapy. The exercising therapy means a great strain for

the patient, as he has to afford a very strong concentration of his will and therefore it is practical to combine it with electrorythmic treatment, besides the high frequency therapy.

We further observe in nearly all tabetics who are treated by high frequency diathermy an improvement of the general tonus. The general state becomes better, the sleep is sounder, the factulty of the patient to do things increases.

It is therefore right to say that high frequency currents are for the present time the most active means which we know of for the treatment of many tabetic symptoms.

The progressive muscle dystrophy affords combined treatment of long duration. The affected muscle parts are treated by warming them by means of plate electrodes. Especially if new muscle groups are going to be involved into the process of the disease, they generally show for some time a light tenderness of which patients complain. These pains are quickly and easily removed by this treatment. Besides, for exercising the diseased muscles a mild treatment by electrorythmic means has to be administered for a long time. It is recommended to apply diathermy plate treatment to the vertebral spine. One succeeds herewith to keep the patients constantly at the same stage and to prevent progressing of the process for several years.

Syringomyelia has not yet been much experienced with diathermy treatments. In a few cases I treated myself I made a peculiar observation. While patients were not able to distinguish hot and cold at the diseased skin areas, they distinctly felt the diathermic heat. There was no suggestion possible, as I had the machine running with equal noise and patients did not know when I really sent current through them.

For acute anterior poliomyelitis or infantile paralysis diathermy means a great progress. Immediately after the fever has dropped treatment may begin bv applying metal electrodes along the spine and the great indifferent electrode to the chest in front. The effect is probably a double one. The deeply produced hyperemia and hyperlymphia raises the local and general antiseptic faculties of the body and the decongestion produced inside the spinal channel relieves the nervous elements from compression. So diathermy means a real etiological treatment, but is not sufficient to the muscles in consequence of the damage done during the feverish state to the motor nerves. Therefore, electrorythmic treatment has to be combined as early as possible. I have seen many cases which by this combination were absolutely free from any residual paralysis. If patients come in a later stage, more or less atrophy has already developed, the even electrorythmic treatment is the only method which can induce some result.

In cases of Jacksonian epilepsy I have tried diathermy treatment. If the place of the mechanical irritation is known, diathermy can be applied locally with good results, not by reducing the attacks at once, but by bringing exostoses, thickening of the dura or scars to resorption. The place on the skull has to be shaved before treatment. In cases of genuine epilepsy results were unequal, sometimes

the intervals seemed to increase between the attacks and they were of different severity; but in this disease irregularities are very common, so only by a large experience an dlong observation the value of diathermy could be made out. I must, however, admit that in some cases diathermy seemed to provoke an attack. Especially if stronger current were used.

In chorea minor good results have been stated. The application has to be made so that the affected muscle systems are connected to one pole and the corresponding spinal area to the other plate electrodes. Especially in children the results are very good and besides the local action the general sedative influence shows itself of value.

Myoclony in paralysis agitans is a very good indication for diathermy treatment. I may refer to two brief histories: One gentleman shows constant jerks of the right arm and right shoulder with general nervous troubles. The speech is stuttering, which formerly was quite normal. After ten sittings all troubles were gone. Healing controlled one year later.

Another patient was suffering from paralysis agitans, continual twitching in the face, agitations of the nape of the neck and the upper part of the trunk, which stopped nearly at intended movements, but in the rest returned immediately. Ten treatments of diathermy applied during three months produced a complete cure. In sclerosis of the brain symptoms like headache, slow speech, troubles in writing, memory and general disposition sleeplessness have been much improved by treatment in the small solenoid for the head, combined with a general treatment to the circulation. Arteriosclerotic insomnia is a special indication for diathermy treatment. The technic to be applied depends on the cause of insomnia.

Considering the functional nervous diseases, they are often in a very narrow neurasthenia it is very important before connection to the circulation. So, for neurasthenia it is very important before the treatment to examine the state of the blood pressure. Hypertonic neurasthenics are to be treated by metal plate electrodes or by solenoid treatment. The hypotonic neurasthenics would be aggravated by this treatment and need condensation electrodes or effluve discharge of sparks.

Angiospastic states like some vasoneuroses or Raynaud's disease have to be treated very locally with small plate electrodes and beginning with low currents. It is of no use to treat the nervous centers, as we are able to secure therapeutical results of duration by local treatment alone. Angiospastic ulcers heal in a few weeks.

There are many more nervous diseases, especially physical diseases, which merit allusion to, but the space is not sufficient to do it here. So we may resume that in many central or peripheral nervous diseases high frequency currents are of considerable value. Very much depends on the right technic of application and therefore a careful examination of the whole patient and exposition of the etiological factors is indispensible.

BIOPHYSICS OF ULTRA VIOLET LIGHT

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A SHORT lecture about the biophysics of ultra violet light can only be started by a comparison of the natural and artificial sources of light. In this comparison as well as in the further progress of the lecture we have to enclose the other parts of the spectrum, the visible and the infra red rays. The visible part is limited by the wave lengths of about 3,900 and 7,700 A. U., 3,900 A. U. representing the shortest violet radiation, 7,700 the longest red radiation. Everything below 3,900 A. U. is ultra violet, everything above 7,700 A. U. is infra red. The ultra violet spectrum is subdivided usually in the near and far ultra violet, from 3,900 to 3,000, and from 3,000 A. U. down to the shortest waves produced.

The only important natural source of light is the sun. The spectrum of the sunlight before it reaches the terrestrial atmosphere has been determined by theoretical deductions as well as by experimental measurements. The maximum intensity of this extra-terrestric spectrum is supposed to be near 4,700 A. U.; from there the intensity decreases in both directions, but faster to the ultra violet than to the infra red side; how far it reaches in either direction is not known accurately. Due to this spectral distribution the sun outside of our atmosphere would appear bluish green to our eye. The total energy of the extra-terrestric light is composed of about 43 per cent infra red, 52 per cent visible, and 5 per cent ultra violet light. On its way through the air a considerable part of the light is absorbed and scattered, the exact amount depending upon the position of the sun and some other factors of minor importance; by absorption and scattering the shorter rays are more affected than the longer ones. Therefore, the intensity ratio of short and long waves is altered in favor of the longer rays. In an average position of the sun the terrestric spectrum is composed of about 60 per cent infra red, about 39 per cent visible and scarcely 1 per cent ultra violet light. The intensity maximum is near 5,900; therefore, the sun appears in a yellow color, close to the horizon even in orange or red. The short wave limit of the terrestric spectrum depends very much upon the position of the sun. Dorno gives measurements for 10° to 60° altitude of the sun. While for 10° the shortest wave length observed is 3,159 A. U., for 60 degrees it is as low as 2,979 A. U. This short wave limit depends largely also upon the altitude of the observer, being much shorter on high mountains than at sea level. The shortest

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wave length ever detected in the solar spectrum is 2,896 A. U. In the lowland, especially in our big cities and industrial centers, very little ultra violet reaches the earth surface. The long wave limit is not so sharply defined as the short wave limit. It seems to extend up to about 5$^{\mu}$, equaling 50,000 A. U., although traces have been detected from about 130,000 to 180,000 A. U. It is of interest to compare the ultra violet, visible and infra red parts of the spectrum as to their variability with the altitude of the sun. While the infra red decreases only 23 per cent, if the altitude of the sun decreases from 65 degrees to 10 degrees, the visible part changes 52 per cent and the ultra violet 97 per cent, and similar changes occur with altitude above sea level and with climatic conditions.

As far as the ultra violet radiation of the sun is concerned, we come to two conclusions:

1. The ultra violet part of the sun's rays is extremely small, amounting to about 1 per cent.

2. The ultra violet part of the sun radiation varies even more than the other rays; this holds true in particular for the far ultra violet.

The atmosphere, by absorbing and diffracting the direct sun rays, on its part becomes a source of radiation, which makes itself manifest as the diffuse sky radiation. Due to the fact that shorter rays are absorbed and diffracted much more, than the longer, the sky radiation contains more shorter and less longer rays than the direct sunlight. Therefore the sky appears of a blue color, as against the yellow of the direct sunlight. In a first approximation, and for average climatic conditions and a medium altitude of the sun, the total sky radiation equals that of the direct sun radiation. However, a pronounced variation occurs with altitude, position of the sun, weather conditions and so on. The ratio of the three sections of the spectrum is also different, in a certain favor of the ultra violet radiation over the visible and infra red rays of the sky. In a medium position the ultra violet radiation of the sky may be three to four times as strong as that of the sun, while the visible and infra red radiation only reaches about one-fifth to one-third of the sun ray intensity. Taken as a whole we can say that the ultra violet radiation of the sky is of the same magnitude as that of the sun, and that it is very variable, though not as much as that of the sun.

In our climate the total energy transmitted to the earth is too small to feel comfortable and to prevent deficiency dieases. The immense variability of the energy makes dosage extremely difficult.

In consequence of these facts various artificial light sources have been constructed and introduced in therapeutics. Three kinds of lamps are used for therapeutics, the incandescent lamps, the carbon arc and the mercury quartz burner. Measurements of the intensity distribution in the spectrum of these various sources of light have been made by various authors. The results vary so much that a comparison of the lamps cannot be based upon these measurements. It seems more advisable to use figures

which are obtained by the same author. Pacini gives these comparative figures in his book, "Outline of Ultra Violet Therapy" for sunlight and the three artificial sources of light mentioned before.

Source—	Infra Red	Light	Ultra Violet
Mercury Vapor	52%	20%	28%
Sunlight	80	13	7
Arc Lamps	85	10	5
Incandescent Lamps	93	6	1

Although the figures for ultra violet are rather high, they give the relationship between the various lights. According to these figures the carbon arc resembles the sunlight much more than the other types, the incandescent lamps producing much more infra red and less visible and ultra violet, while the mercury vapor lamps behave just the opposite way.

Another recent paper of Bleibaum gives a comparison of the same three types of lamps and the sun, for four equal parts of the visible and ultra violet spectrum, 6,000-5,000, 5,000-4,000, 4,000 3,000, —3,000 A. U., thus not taking into consideration the longer visible radiation and the infrared rays. The figures of Bleibaum are compiled in the following chart:

According to these figures the incandescent lamps approach the sunlight more than the carbon arcs. Both charts strongly indicate the superiority of the mercury quartz lamp for ultra violet Bleibaum's chart even differentiates for the near and far ultra violet and proves that the mercury lamp produces more far ultra violet than the carbon arc. This holds true especially for the water cooled (Kromayer) lamp, which emits a larger percentage of short ultra violet, and a smaller amount of infra red rays, due to the facts, that in the air cooled lamp a selective absorption of the far ultra violet takes place by luminiscent vapor of lower temperature, while in the water cooled lamp the longer infra red rays are strongly absorbed by the water filter. Both charts indicate, that the name artificial sunlight or Alpine light is not applicable to the mercury quartz lamps; certain modifications of incandescent and carbon lamps, as the Spectrosol or the Ulilamp have more right to this name.

In order to prepare ourselves for at least a partial understanding of the biological action of the rays, we have to consider several physical properties of the rays: When light rays strike the surface of a medium a part is reflected, another

		Total Energy	Percentage of energy for the infra red				
SOURCE OF LIGHT		6000	6000—5000	5000—4000	4000—3000	3000	LIMITATION DUE TO
Sun		100	43.5	41.6	14.9	0	Atmosphere 3000 A. U.
Incandescent Lamps	Solux						
	Spectrosol	100	63.5	25.0	11.5	0	Glass 3000 A. U.
Mercury Vapor Lamps	Quartz	100	28.3	13.9	37.4	20.4	Quartz 2000 A. U.
	Uli	100	48.1	26.5	16.8	8.6	Uviol Glass 2500 A. U.
Carbon Arc	Ultra lux	100	21.4	37.2	37.6	3.8	2300 A. U.
	Heliol	100	18.1	23.4	58.5	0	Special Glass 2900 A. U.

part enters the medium. The latter part while traveling through the medium gradually is absorbed. Finally a part might succeed in penetrating the medium. From the incident, reflected and penetrating energy we can figure the absorbed energy. This is the only one which is transformed in other kinds of energy; e.g., heat, photo-electric, chemical energy, and finally producing biologic effects, provided the absorption taking place in the living tissue. Therefore, we might say: The reflected part, the part absorbed before reaching living tissue, and the part penetrating through the tissue do not affect the tissue; only the energy absorbed in the living tissue produces biologic effects.

All the properties as mentioned before depend upon the wave length of the incident radiation and the exposed material. Thus a reflexion coefficient, a transmission coefficient and an absorption coefficient can be determined for various substances and various wave lengths. The reflection of the different colors has been measured by Schultze for human skin. Schultze determined the presence of one or two strong maxima of reflection in red and orange, corresponding to as high a reflexion as 30 to 60 per cent, sometimes close to 100 per cent. From there the reflected intensity decreases toward the infra red as well as the ultra violet. There is, however, a secondary lower maximum in green or yellow green. In the extreme violet the intensity is as low as 10 per cent and probably even lower in the ultra violet, although this has never been determined. The reflexion curves depend very much upon the complexion, part of the body exposed, age, race, pigmentation. This has been shown in particular by a recent paper of Dorno. It might not be incidental that the general course of the reflexion curve resembles the intensity curve of the sunlight. It seems that the body has learned to protect itself against the strongest components of solar radiation.

Although many observations are recorded about the penetration of light of various wave lengths into the skin, the exact absorption curve for the total spectrum has not yet been established. The problem is very difficult, because as many factors are to be considered as concerning the reflexion by the skin. Finsen has shown that the penetration depends greatly upon the blood content of the dermis; in a similar way it will depend upon complexion, pigmentation, location, age, race, etc. That much is known, however, that the visible light penetrates better than the infra red and the ultra violet light.

For the ultra violet Hasselbach has determined the percentage of radiation penetrating through a thickness of 0.1 mm. These are his results: For the wave lengths:

4360 A. U.	59 per cent.
4050 A. U.	55 per cent.
3660 A. U.	49 per cent.
3340 A. U.	42 per cent.
3130 A. U.	30 per cent.
3020 A. U.	8 per cent.
2970 A. U.	2 per cent.
2890 A. U.	.01 per cent.

Sonne has shown that the infrared rays are mostly absorbed in the very outside layers of the skin and that an application of 1.2 to 1.3 Kal per centimeter for one minute heats the skin to the toleration point; the visible rays, however, penetrate to a considerable depth and distribute themselves through a larger volume; therefore the skin can stand about 2 Kal. The red part, which is very little absorbed by the blood, might even penetrate for one or two cm.

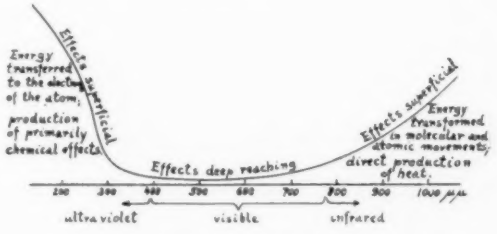
The question, how much energy is absorbed in the different depths of tissue will always come up, if the biological action of rays is to be explained or should be predicted. Although it is generally accepted that the absorbed energy is a factor of prime importance determining the biologic effects, the problem now comes up whether the amount of absorbed energy is the only physical factor; in other words, whether all wave lengths produce the same biological effect, provided the same amount of energy is absorbed in a given volume of tissue. The opposite possibility would be that, although the same energy is absorbed, the biologic effect would depend upon the wave length of the radiation.

From the physical point of view we are inclined to expect a different action of longer and shorter rays. Very long rays can only affect the molecules as a whole, causing them to vibrate, and thus producing heat. This holds true in particular for diathermy, using electromagnetic waves of about 300 m. wave length. Also the infra red waves are supposed to produce pure heat, just affecting the molecules as a whole.

Very short rays, in particular radium γ rays and x rays, are too short to attack the whole molecule; they concentrate upon the electrons, loosening or even detaching them from the rest. Thus their action is a photo-electronic, which primarily results in chemical changes. There might be a final transformation of the total energy into heat, but the intermediate changes seem to be responsible for the biologic reactions.

In the case of light and ultra violet, both the photo-electronic and the heat effects are present, but their ratio varies with the wave length. For longer waves the heating effect preponderates, for shorter waves the chemical effect is more pronounced.

It is of great interest to divide the spectrum according to the physical properties of absorption and transformation of energy. According to this we can distinguish three sections:



Classification of lightwaves.

The first section, on the slope of the curve of absorption due to primary photo electronic transformation. This part is characterized by great absorption, chemical effects, superficial reactions, and coincides mainly with the ultraviolet.

The second section, on the slope of the curve of absorption due to heat transformation. This part is also characterized by pronounced absorption, superficial reaction, heat effects, and coincides mainly with the infrared.

The third part lies between both and is characterized by little absorption, therefore good penetration, a mixture of chemical and heat effect, and coincides mainly with the visible part of the spectrum. It surely is no accidental coincidence that the body has developed an optical system just appropriate for these penetrating rays.

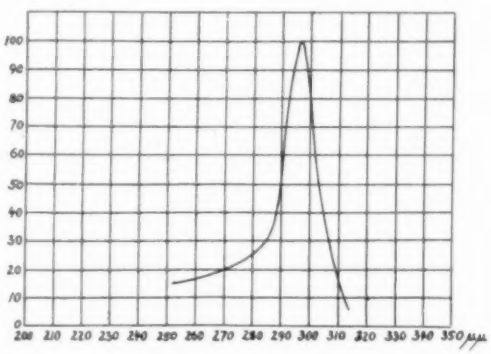
After these introductory physical remarks let us consider the most important biological effects of radiation:

The best observed biologic reaction is the erythema and pigmentation, which follow a short wave radiation of the skin after a certain time of latency. Until recently it was not known which part of the spectrum caused this reaction. In order to solve this biophysical problem, Hausser and Vahle have exposed human skin to the spectral lines of a mercury quartz lamp, the relative intensities of which is well known. They determined the reaction of the skin quantitatively too, and thus were enabled to give a susceptibility curve of the skin for various wave lengths.

The curve indicates that a narrow range of wave length causes the reaction of the skin, starting with about 3100 A. U., and extending down to about 2500 or 2300 A. U., with a sharp maximum near 2970 A. U. This behavior is interesting from several points of view:

1. The terrestric sun spectrum contains only a part of the radiation which causes the pronounced skin reaction; and this part of the sun spectrum is the most variable; under unfavorable conditions it is not transmitted to the earth at all. The maximum of the susceptibility curve coincides practically with the shortest wave length of the sun spectrum under average conditions.

2. The part of the curve towards shorter wave length from the maximum corresponds to a radiation which has an extremely low penetration. Right with the maximum of the curve, the absorption of protoplasm increases strongly; and the diminution of sensitivity with still shorter wave length is produced by this increase of absorption which prevents the rays from penetrating in any depth.



Skin sensitivity.

The wave length 2890 A. U., which still produces a pronounced erythema, penetrates into a depth of .1 mm. with only .01 per cent. This is the average depth in which in the adult the first living cells are supposed to be, the stratum lucidum and the germinal layer. The blood vessels and nerves are at least two

times as deep and are not reached by any radiation of shorter wave length than 3000 A. U. The skin of infants is thinner, and living cells can be found in 10 to 20$^{\mu}$ depth; even the blood vessels and nerves are as close as 25 to 30$^{\mu}$ from the surface.

3. The longer wave part of the curve is the most striking. In a range of about 150 A. U. the curve decreases from its maximum to practically zero. At the present time there exists no possibility of any explanation of that. It seems to me that only selective absorption in a biologically actives ubstance of the skin can be responsible for this behavior. Investigations are planned which might enable us to detect such absorbing parts.

Analogous experiments as about the ultra violet erythema have been made about the efficiency of radiation towards the prevention of rickets. The most conclusive experiments are those of A. F. Hess and his coworkers. They found that no wave lengths longer than 3020 or possibly 3130 A. U. can cure rickets in rats. Corresponding experiments with men have never been conducted. However, the fact that sunlight filtered through glass and the mercantile incandescent lamps do not cure rickets corroborates the quoted experiments. It is also known that rickets occurs particularly in the dusty, misty climate of England, where the extreme ultra violet of the sun is practically all absorbed before it reaches the earth. It also occurs seasonally, with a predominance in winter and spring.

The action of the short waves in rickets is not so difficult to be understood than in the production of an erythema, because of the very thin horny layer in the skin of infants and children. Our knowledge about the cure of rickets has been widened by the comparatively new discovery by American scientists that certain foodstuffs, which are inactive as to the prevention of rickets, become antirachitic after ultra violet radiation. The latest experimental achievement along this line is the proof that cholesterol is responsible for this activation. Benver has shown that cholesterol yields an antirachitic substance of not yte known chemical structure. Now cholesterol is a necessary part of every cell, and it occurs even in a higher concentration in the glandular part of the skin. It is therefore probable that the antirachitic effect of radiation of the skin is due to the absorption of this substance by the bloodstream. It seems possible thus, at the present time to follow back two apparently different effects to the same source: The vitamin production by the treatment of foodstuffs, and the endocrinal hormon production by the radiated skin, to the chemical change of cholesterol by ultra violet radiation. This substance affects the calcium and phosphorus metabolism in a way which is not yet known. The calcium content of the blood is increased and its fixation as calcium phosphate is facilitated after radiation. Ultra violet radiation is therefore used also to hasten the new bone formation after fracture. Regular and early ultra violet application may also help prevent de-

generative and carious teeth. The calcium-potassium equilibrium seems to play an important role in the susceptibility to cancer; it should be tried to effect a change of metabolism in favor of calcium in cancerous patients, and in precancerous stages.

Another property of ultra violet light that is well investigated is their bactericidal action. The direct effect of the ultra violet rays upon the bacteria can be demonstrated by exposure of a culture of bacteria which is transparent to the ultra violet rays, to a mercury quartz lamp. Under the ordinary treatment conditions an exposure of a few seconds to one minute is sufficient to kill all the bacteria. This direct action is made use of in the modern sterilization of drinking water by ultra violet radiation. This direct effect is supposed to be due to a coagulation of the protoplasma, similar to that produced by heat. However, it has been shown by many investigators that the short wave rays are the ones which secure the strongest effects. According to Henry the bactericidal action starts mildly with about 3000 A. U., increasing gradually with shorter waves, and showing a maximum with 2800 A. U. Browning and Russ found that the germicidal action is mild for 2100 and 2960 A. U., and strong for 2540 to 2800 A. U.; Bovie considers the bactericidal action strongest from 2500 to 3000 A. U. (Newcomer 280-210, no action 297), (Newcomer 295°-186°, Max. 275), Linden 350° 185° A. U.). The sensitivity curve of the bacteria toward the ultra violet rays coincides very closely with the absorption curves of egg albumen and serum, as measured by Henry and by Burge. The first absorption maximum of these substances occurs near 2800 A. U., and after a mild depression the absorption increases again to immense figures near 2400 A. U. and shorter wave lengths. While the experiments as mentioned above deal with the direct exposure of the bacteria to the ultra violet radiation, conditions are different as soon as the bacteria inhabit the human skin or even deeper structures of the body. In this case the farther ultra violet can not reach them. However, even in these infectious diseases the use of ultra violet radiation has proved to be very effective. In this case it is the production of an erythema with the hyperemia, which helps curing diseases as lupus, scrofuloderma, furunculosis, alopecia areata and others. It seems natural that for the treatment of these conditions the rays are more fit, which produce a maximum erythema. Finsen even introduced the carbon arc in the treatment of lupus, which is extremely rich of the near ultra violet rays, in particular below 3883 A. U. Wonderful results have been obtained in the treatment of glandular, bone, and pulmonary tuberculosis by general ultra violet treatment, in particular by the use of natural sunlight in Alpine resorts. In these cases the general effect of ultra violet as well as many other factors upon the whole body, the nervous system, the endocrinal glands, etc., are responsible for the improvements.

There are some other more or less general effects of the ultra violet radiation upon the human body, which appear especially after general application of Alpine light to the whole body. Although these effects are not studied as well biophysically as the specific effects mentioned before, at least some facts are already established.

There is the increase of the red blood corpuscles, which is pronounced in cases of a low count, and little in normal con ditions. This suggests the treatment of anemia by ultra violet.

On the other hand there is a decrease of the leucocytes, especially if the count is abnormally high; there are also changes in the differential count which are not yet established properly. The treatment of leukemic diseases might be based upon these effects.

The blood pressure can be lowered by ultra violet and light treatment. This decrease occurs in practically every case, varying however between figures of 1 or 2 mm. and those of 15 or even 17 mm. This reaction can be used for the treatment of high blood pressure.

Further I will mention the increase of metabolism, which results in an increase of diuresis. This observance has led to the treatment of obesity, gout, arthritis, arteriosclerosis, and kidney diseases.

Finally an analgesic effect of the ultra violet and light treatment has been observed, which suggests the treatment of sciatica, neuralgia, lumbago and rheumatic affections. Although most authors agree about the occurrence of these effects, practically nothing is known how they are produced biophysically. It seems to the author that the theory is best founded, which assumes a stimulation of the autonomous nerve system by the radiation. The close relationship between the skin and the endocrinal glands is established by this system and the distant effect of the ultra violet radiation upon the endocrinal glands would be easily understood. The effect upon the blood pressure and the constituents of the blood can also be explained that way. The occurrence of an erythema and a pigmentation is by no means a direct effect of radiation upon the radiated skin. It is a certain effect of the skin, which affects the nervous and endocrinal system, which in their turn cause capillary dilatation and pigmentation. While the stimulation of the nervous system seems well founded, it is questionable whether this effect is a direct result of the radiation of the nerve endings or an indirect one. It seems to the author that the heating effect of the longer waves, visible and near infra red is able to penetrate to the nerve endings and to affect them primarily; however, this explanation cannot hold true for the ultra violet in particular the far ultra violet rays which do not penetrate sufficiently as to reach the nerve fibrils. Therefore we must suppose that the radiation affects primarily the epidermal cells, and by chemical changes and diffusion of the products to the lower strata and finally to the derma effects a stimulation of the nerve endings.

What the chemical changes are is not yet finally established; but several opin-

ions have been advanced and a few experimental facts substantiate them:

It is known by those early experiments as by Neuberg that the organic constituents of the cells, as proteins, fats, carbohydrates, lipoids, etc., in chemically pure condition are not affected by an exposure to reasonable doses of ultra violet. These substances, however, grow very photosensitive if they are accompanied by minerals, such as are always present in the organism. While e. g. a pure solution of sugar is not affected by the light, it becomes photosensitive as soon as a catalysator like an iron or uranium salt is added. Such a combination of organic substances and inorganic compounds represents a photosensitive system, with chemical reaction following the irradiation by light, x ray, radium. So in connection with the minerals of the organism, the sacharids become inverted and simplified, the proteins become hydrolysed and split into aminoacids, etc. An experiment that I conducted recently proved that the destruction of cholesterol by the x rays only occurs if the cholesterol is dissolved in chloroform or carbontetrachlorid due to a primary change of the solvent and an indirect effect of this upon the cholesterol. Since I made this observation I am doubtful whether the activation and the destruction of cholesterol by ultra violet is a direct effect upon the cholesterol or is indirectly caused by the solvent or impurities.

That chemical elements are affected and, as we might say, activated by radia tion, is a fact long known to physicists. The absorbed energy of the radiation causes a rise of the revolving electrons from one to a higher level. As long as the electrons move along this higher potential, the whole atom is in an activated condition, representing an increased energy stored up, which can be disposed of momentarily or after a certain latent period. The return to the normal stage might be marked by fluorescence, phosphorescence, etc. Certain elements and compounds lose electrons completely after radiation, i. e. they are photoelectric. On this principle the Cadmium cell has been built, which is so convenient for optical measurements. While these physico-chemical facts are long known, it is only recently that the full importance of activated elements has been revealed for biology and therapeutics. This was accomplished in particular by the studies of Baudish and Welo about the mineral metabolism, in particular of Fe. These authors found that mineral waters were more effective therapeutically, at the source, than after shipment. They could prove that Fe salts e. g. iron carbonate were responsible for this, which show a certain activity while fresh, and lose this activity after some time. The activity consists in the power of absorbing oxygen and applying it to organic substances, e. g. proteins. They further could prove that blood produces simlar reactions as those activated Fe compounds. The same rapid growth of bacteria cultures follows, if a trace of blood or fresh Fe salt is added to the agar. These experiments have been extended by Bass and Baudish, who suc-

ceeded in activating Fe salts by sunlight. Sodium ferro cyanide e. g. after sunlight exposure yields a very active substance, which makes bacteria grow. Iron is a constituent of every living cell, probably because in its activated stage it is a fun damentally important substance for oxygen metabolism. Let us try the following conclusion:

Cell respiration is effected by the activity of iron; iron is activated by light; light is important for respiration.

The correctness of this conclusion has been proved long ago by Quincke. He demonstrated that all kinds of cells (blood, pus, muscle, liver, kidney) resorb much more oxygen after radiation than without radiation. He concluded that light increases the oxydizing power of the living cells. Hertel conducted similar experiments; he radiated blood, and observed spectroscopically the change from oxyhemoglobin into the reduced hemoglobin. According to these experiments light can be considered as a catalysator, which, like peroxydase, transports oxygen to those substances which are little oxydable and so causes and regulates their oxydation. H. Meyer tested the effect of light of varying wave length and intensity upon the oxydizing power of peroxydase. He found that visible light always increased the oxydation, near ultra violet increased in small doses, decreased however in excessive doses. The far ultra violet even decreased oxydation in small doses; red radiations were ineffective. In these results Meyer recognizes the Arndt Schultz law, which states that small doses have a stimulating, large doses a suppressing effect upon growth and function. The limit between small and large doses varies widely with the wave length; for red rays e. g. every dosage which is practically applicable seems to belong to small doses. After Meyer's experiment the epidermis and their pigment formation is a protective filter for the peroxydase, in the capillaries of the derma, against the far ultra violet; the near ultra violet probably is the most activating radiation for the oxygen metabolism. Meyer's experiments explain a clinical observation, the deeper respiration with and after the exposure to light. The larger demand for oxygen due to the light stimulation asks for such an effect and the body complies with it by the mentioned reflex.

After this excursion into theories let us come to practical conclusions. We are now able to find out what the most desirable sources of light are for therapeutic work.

We have seen that we need an intensive ultra violet radiation of the range of about 2000 A. U. for many purposes, as for the curing of rickets, tuberculosis, and many skin diseases. The mercury quartz lamp is far superior to any other artificial lamp or the sunlight, in this respect. It should be used, however, by the doctor only, and should be administered very carefully by himself or a trained nurse. Over exposure would do much harm; the eyes must be protected particularly. Therefore it should not be used as a patient's model. It is also too

expensive for this purpose. For the treatment of diseases of metabolism, as arthritis, gout, obesity, etc., and of neuralgic diseases the nearer ultra violet, visible light and even the near infra red radiation is preferable. This radiation is less irritating and therefore less dangerous, as long as overheating is avoided. It is furnished best by a strong incandescent lamp, commonly called the radiant light. Strong lamps should also be used exclusively by the doctor or the nurse under the doctor's supervision. Weaker lamps could be used as a patient's model.

This as far as the threapeutic use of radiation is concerned. I should like, however, to bring up the question whether it would not seem more advisable to prevent than to cure. Why should we use the light to cure diseases after we have acquired these diseases by keeping ourselves excluded from the light? By neglecting our body for the longest part of our life and then trying to correct the errors, mostly when it is too late? Should we not better try to expose ourselves to the rays early enough to prevent rickets, anemia, the inclination toward tuberculosis and many other infective diseases, skin diseases, metabolic disturbances and high blood pressure?

I think it is the duty of science and medicine to develop a technic of such a preventive treatment and educate the public to use it. In our climate and under the present form of civilization we are unfortunately not able to make any proper use of the natural light. In a city like Chicago about one-third of the year is warm enough with days long enough to enjoy the beaches. As a daily average about one-tenth of the population make use of them. They may spend about three hours on the average, mostly in the late afternoon. The percentage of the efficient part of ultra violet is very small as compared with the open country, noon time, lower geographic latitude, higher altitude. They finally expose about one-third of their surface, otherwise they get into all kinds of trouble. Under these conditions an artificial source of light should be designed with characteristics as follows:

1. Sufficient visible and infra red rays as to make it comfortable for exposure of the whole body, in complete nakedness. It should enable one to read without strain to the eyes.

2. Sufficient ultra violet radiation in order to prevent rickets, to stimulate the autonomous system and the endocrinal system, not so much as to produce a marked erythema or to irritate the eyes.

3. Low costs of the lamp, simple way to install it in the sleeping room or bathroom, low costs of operating it.

Light treatments should be taken every day, comparable to the daily bath or the daily sleep, or meals. The best time would be before going to bed. As momentary advantage of such a scheme may be noted:

Relaxation of mind and muscles.

Lowering of the blood pressure.

Promotion of evaporation.

All these factors will help towards a good night's rest and sleep.

Among permanent results may be considered the avoidance of most deficiency diseases, as rickets; establishment of increased resistance toward certain infec tious diseases, such as tuberculosis; many skin diseases, as psoriasis for instance; finally diseases of the metabolism, which mostly occur in advanced age.

Finally I would like to say a few words about the dosage of light. The problem is to measure that radiation only, which produces a certain biologic effect. Unless this is done, no prediction as to the biologic result, nor any comparison of various sources of light can be made. In particular after it had been determined that a very small range of rays is responsible for the production of an erythema, and the cure of rickets, we must require that a dosimeter just registers this range of wave lengths. Therefore, the dosimeters which determine the total energy of the radiation, as heat produced, e. g. the thermopile or bolometer, cannot be used for our purposes. It is doubtful whether other methods are more useful, which make use of certain chemical or electric reactions, as the iodine liberation from potassium iodine, or the change of resistance of selenium. Dorno claims that the photo-electric sensitivity of the cadmium cell goes parallel with the sensitivity of the skin. Although it may be admitted that both sensitivity curves re semble each other, they differ, however, in so far as the maxima of both curves do not fall on the same wave length and the skin sensitivity curve is much sharper than that of the cadmium cell. It seems possible, however, to construct a dosimeter with so close an approximation to the biologic effects that it be sufficient for practical purposes.

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EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

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THE CREED OF THE DISABLED

"Once more to be useful, to see the pity in the eyes of my friends replaced by commendation, to work, provide, seeking no favors and giving none, a man among men in spite of my physical handicaps."

It seems to me that is the ideal of physical therapy. I know of no branch of medicine that can do more towards rehabilitating the disabled, towards refitting them for economic usefulness in the world once more than the specialty of physical therapy, combined with proper use of other branches of medicine. It is physical therapy that finally must come to the great majority of disabled to help restore function and put them in position to once more become producers.

In other words, physical therapists stand for one of the greatest things that the medical profession stands for, that is human conservation, human salvage. As has been said, the American Medical Association has come to recognize physical therapy as a definite entity of medicine. I think when Dr. Smith, the delegate of Wisconsin, got up and moved

the delegates of the American Medical Association pass a resolution to the trustees of the American Medical Association recommending that a Council on Physical Therapy be appointed, it was one of the greatest advances that we have made in medicine in the last decade. For years we have had a Council on Pharmacy for the purpose of protecting to a large extent the public against the ravages of so many patent medicines. The Council on Physical Therapy is composed of such men as Bovie, of Harvard; Wharton, of Ann Arbor; Cannon, of Boston; Woods, of Columbia University; Desjardine, of the Mayo Clinic; Granger, of Boston, one of the leading physical therapists; McKee, the dermatologist, of New York; Pemberton, of Philadelphia, an internist; Williams, a physiologist, and myself.

The Council has only two or three men on it who are actually working in physical therapy. The rest of them are internists, a surgeon, a physiologist, a pathologist, a cancer research man, Drs. Woods, Desjardins and Granger, and McKee representing the actual work of physical therapy.

The official view that I want to express is that the Council recognizes physical therapy is of great value and is of equal importance in the medical profession as any other special branch of medicine or surgery.

The Council of Physical Therapy, recognizing this, wants to do everything in its power to help keep physical therapy on the high plane to which many of the leaders in that specialty have brought it in the last few years. They want to add their power and influence to the leaders in physical therapy to stamp out some of the features of physical therapy which placed it in the past in the hands of the quacks and charlatans. Those are the purposes of the Council. There is a lot of technical work along with it.

Let me tell you a little bit about this Council on Pharmacy. Whenever a manufacturer wishes to bring out a new proprietary medicine and have it used by the profession, they must submit it to the Council on Pharmacy and a very, very careful investigation of all the claims for that medicine is made by the Council. After the investigation has been thoroughly made, if the medicine is everything that is represented and is of value, official sanction of the medicine is given. The same thing will apply in the work of the Council on Physical Therapy. We are going to call on leaders in your special field time and again to help us out in arriving at the conclusion, whether or not a given apparatus, a given machine, a given physical agent has all the value that is claimed by the manufacturers. If it proves that it has, then it will receive the sanction of the Council. Already every manufacturer of physical agents has been notified of the formation of the Council on Physical Therapy, and they are sending in all new apparati that are being devised. We are gradually working over the old. You would be surprised at some of the things that are sent in. The latest is a new tube that is supposed to wash out everything from the stomach through the intestines and

so forth, and it is the most ingenious thing I have ever run across. Some of them are of great value and others are simply of spectacular and commercial value. I can see already where the Council is going to be of great value to the profession in going over all of these things. As I say, we can only do it by the help of men absolutely familiar with the various things used.

Since I have no regular paper prepared, there are just a few things that I want to bring up. In doing it I must refer to our first official report which appeared in a recent issue of *The Journal of the American Medical Association.* Many of you have seen it. *The Journal of the American Medical Association* now will have its department of physical therapy just as the department of drugs, which alone is a great advance to have the profession recognize this specialty. It is a shame that it hasn't been done before. It is no wonder that we have osteopaths and chiropractors and all kinds of cults when we as doctors refused to recognize the good that existed in physical agents. We thus allowed the cults outside of our profession to take them up and pass them over to the public and the public recognized the good in them. I had a patient with a stiff elbow whom I told to go home and let his wife massage and work with it and put it in hot water and so forth. He got tired of that unsupervised method and came back to me. I didn't have anything better to offer. Where would he go to get it? To someone outside of the profession who was willing to recognize the value of physical therapy or physical measures as a means of getting functional restoration. That was what the man was after. He didn't care whether it was given by a good surgeon or by a horse doctor, just so he got it. It took the profession a long, long time before they recognized that fact.

Physical therapy has come to the front so rapidly and with so much enthusiasm on the part of a great many of us that great care must be observed lest we go too far with it.

I don't know whether it would be a good thing for every doctor in the country to have physical therapy equipment in his office or not after traveling around and seeing the way some doctors are using it. We must train a new tribe of doctors in the future who will know it just as they know how to give castor oil and strychnine. Then perhaps it will be safe. Today it is not safe for every doctor to have physical therapy equipment in his office.

To carry that thought a little farther, in industrial surgery many of us have done a great deal of talking about the functional restoration of the disabled. Naturally, the two places to find the disabled are in the U. S. Army in this country during the world war and in the industrial army that is with us all the time. As pointed out so many, many times with figures, we have annually three times the casualties in our industrial army that we ever had in our military army. Where we raised hundreds of thousands and millions of dollars for the rehabilitation of the military soldier, we had raised only about $100,000 up to

a very short time ago for the rehabilitation of these soldiers from the industrial army. So we have talked rehabilitation of the disabled from industry and one of the methods of rehabilitation is physical therapy. Every Tom, Dick and Harry who has been doing any kind of industrial work went down and bought a water cooled lamp or a little lamp or sometimes an electric light with a reflector around it. The poor man with the injured elbow receives further continued supervision in the hopes of getting help. As long as the doctor is willing to do something the patient is going back to the doctor who will work at his elbow. What does he get? He goes back, "Good morning, Bill. The nurse is in there." He goes in to the nurse and there are five or six or a dozen others in the same room. She puts his arm on the table. It is still bent. She turns the light on. He stays there fifteen minutes. She says, "That is enough for you, go on." He puts on his coat and goes home and comes back the next time. That is no exaggeration.

That is a type of physical therapy we must condemn. It became so prominent in one very large industrial state where industrial surgery is well organized. The insurance companies published the fact they would not pay physical therapy bills in that state. If the doctors rendered physical therapy they did it at their own expense. They were through paying for physical therapy. You can't blame them for that. My goodness, the bills almost treble when they treat the case of the elbow until it is cured as compared with the man who is turned loose to let his wife do it. The wife can do it a lot better in many cases because she will stick to it and make the man move his elbow. She can do it much better than a nurse just turning a light on it. At current charges you can imagine what the insurance companies are paying all over the country for half-baked physical therapy methods.

I am dwelling rather long and hard on that because it is one of the things that we must have the Council of Physical Therapy and the *American College of Physical Therapy* join hands in eradicating. I mean inadequate, improper physical therapy, half-baked (I like that term) physical therapy methods.

A friend of mine, a doctor, has bought a water cooled lamp and put it in his home and whenever the children have a little cough, he turns the light on them. He says it is wonderful the way it will check a cold. Two of his neighbors put in a lamp recently. I know some one else who is going to put one in. It isn't right for us to turn these things loose on the public without any knowledge whatever of their use. So there are a great many places where education must come in.

Physical therapy came into its legitimate place in medicine during the world war. Today it is gradually taking its place with the usual medical and surgical procedures. Unless we guard against bad habits in its usage, against allowing it to replace careful diagnostic measures, followed by well defined but less spectacular methods of treatment and especially unless we guard against its insidious tendency to make its master an easy

living, physical therapy may lead into dishonest practice or quackery.

I think that is the keynote of our effort during the next four or five years of our development.

The only other point that I want to mention is that the Council on Physical Therapy is going to do everything in its power to bring the teaching of physical therapy up to a similar basis that medicine, surgery and obstetrics and gynecology and eye, ear, nose and throat and anesthetics have today. That is what I meant a minute ago by the development of a new tribe of doctors in the future who have this viewpoint, not of just merely giving this medicine and doing this operation until the medical and surgical end results have been obtained, but a new tribe of doctors who will look to that economic end result that I mentioned in the beginning of my talk.

HARRY E. MOCK, M. D.
Chairman of Council on Physical Therapy, American Medical Association.

TREATMENT OF NEOPLASTIC DISEASES

The treatment of neoplastic and allied diseases has occupied the time of research workers for many years past and is still a problem of great moment. It should, however, be recognized that some definite progress has been made, especially with the advent of modern electrotherapeutic methods.

Electrosurgery has been making marked strides. Surgeons are continually making inquiries about technique and are anxious to learn from the more experienced the results obtained with electrothermic procedures.

Emphasis must be laid on the fact that electrocoagulation, for instance, is not heralded as a cure, but merely as an adjunct to the several recognized helpful methods. It must not be depended upon alone. These facts are brought out in a recent writing by William L. Clark of Philadelphia. "One who depends on a single method in the treatment of malignant diseases may not hope to obtain anything but a limited degree of success.

"Experience has taught that operative surgery, electrothermic methods and roentgen rays are all factors of such importance that none of them can be eliminated. We hold no brief for any particular method, but experience has demonstrated the extreme importance of electrothermic methods, which, through a misunderstanding of them, have not yet taken their rightful place in surgery. We consider them second to none, and in many emergencies, superior to all the others" A.R.H.

TECHNICIAN'S BUREAU

The American College of Physical Therapy announces the opening of a Technician's Bureau. The purposes of this bureau will be to register qualified technicians in physical therapy in order to supply the needs of physicians anywhere in North America. In order to handle the situation successfully physicians are asked to communicate with the bureau office, specify their wants as accurately as possible with reference to the

nature of their work and also the salary to be paid. The bureau will endeavor to supply trained technicians who are registered on its roster to physicians or institutions having vacancies.

A nominal charge of ten dollars will be made of technicians desiring to register, and a similar fee will be payable annually if the registrant desires to have his or her name remain on the roster for permanent reference. This fee will include annual subscription to the official journal of the College, "Archives of Physical Therapy, X Ray, Radium."

It should be noted by those desiring to take advantage of this new department that some little time will be consumed in organization. But assurance is given that the bureau will endeavor to handle all cases to the satisfaction of all concerned.

Technicians should send for enrollment blank, fill it out and mail to the bureau office promptly.

At the present time the bureau has several good positions available for technicians who have had proper training.

Address all communications to

Technician's Bureau
American College of Physical Therapy,
Suite 820-30 North Michigan Ave.,
Chicago, Illinois.

NEW EQUIPMENT

VERTICAL STEREO-RADIOGRAPHIC UNIT

VICTOR X RAY CORP.,
Chicago

UNLESS the x ray laboratory is properly equipped, a patient submitted for stereo-radiographs of the chest, or for heart, gastro-intestinal, gall bladder or cervical radiography in the vertical position, immediately presents a problem to the roentgenologist.

The newer techniques now frequently used for this work call for high milliamperages, short exposures and tube-to-film distances of three to six feet. True radiographs are possible in these cases only when every operating factor is according to the very exacting technique required. For instance, the film must be properly centered to the film. When stereo-radiographs are desired, a quick vertical shift of the tube must be had, the extent of this shift depending upon the distance between the tube target and the film. Only technicians who have been called upon to produce radiographs of this kind with make-shift arrangement of equipment can fully appreciate the difficul-

ties involved, with the attendant risk of failure and the questionable diagnostic value of the radiographs produced.

There is a notably increasing use of this newer technique in the hospital and specialized x ray laboratory, and indications are that it will become a routine procedure in the radiographic observation of numerous conditions. A close study of the requirements in apparatus for the purpose has prompted engineers to design a combination unit which makes possible the obtaining of these radiographs quickly, practically, conveniently, and efficiently.

The first essential for this unit was available in the form of the Balanced Cassette Changer, with which most every one is already familiar. To utilize this unit with a vertical stereo tube shifting device which would do away with the

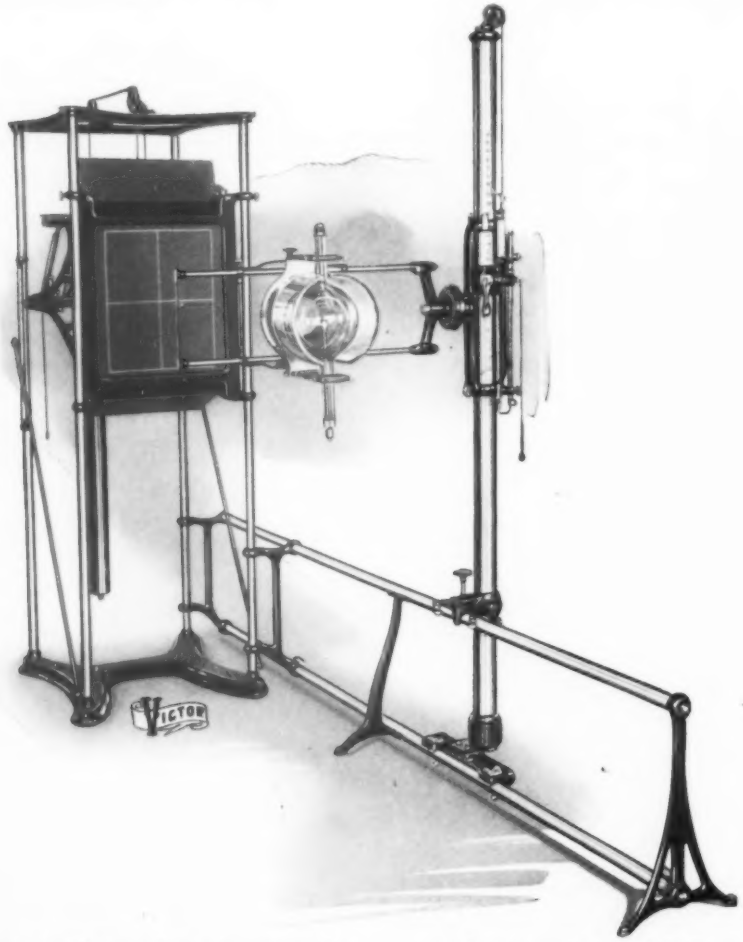

Fig. 1.—The tube stand with its rail attachment can be placed on either the right or left side. As the Cassette Changer is also operable from either side, one will readily appreciate the additional advantage in the flexibility of the entire unit when it comes to installation.
The pull cords may be substituted with magnetic releases which operate simultaneously through an electrical connecting cord and push button held in the operator's hand.

inconsistencies found in these devices up to the present, would offer the ideal arrangement. Such a device has been designed by our engineers, through the application of certain mechanical principles similar to those which contribute to the high operating efficiency of the Balanced Cassette Changer.

Air cylinders and oil cylinders, as used up to the present for checking the vertical shift of the comparatively heavy tube carriage, have here been discarded because of their variables due to atmospheric and temperature changes, and other troublesome features such as oil leakage. Instead, in the new design this shift is controlled by a purely mechanical brake, which has features of permanent adjustment, so that there is no resulting jar and a negligible amount of vibration. Thus the seemingly unsurmountable problem of designing a practical vertical tube shifting device has been solved.

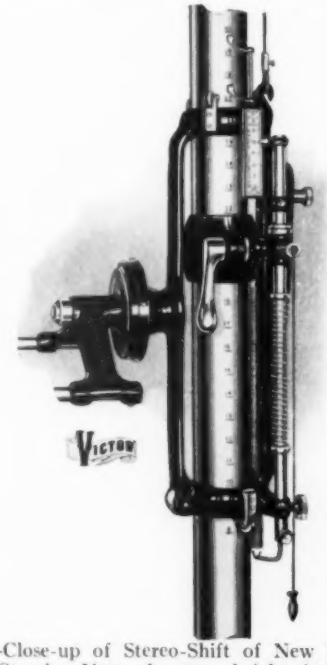

Fig. 2.—Close-up of Stereo-Shift of New Victor Tube Stand. Note the two height indicators—one for use in stereo work, the other for straight radiography. The lower scale is used to set for any desired travel of the tube shift within the range of 2½ to 5 inches.

This roller and brake system gives the utmost refinement of control to the vertical shift, the release corresponding to a hair trigger action and the tube carriage coming to the stopping point quickly without any appreciable vibration. An adjusting device permits changes in the brake action to compensate for variations in weight of the tube carriage, as with different tubes and shields.

The stereo tube shifting device is an integral part of the new tube stand. In other words, it is an attachment but is built into the tube stand proper.

To illustrate how very practical and simple the operation of the Stereo-Radiographic Unit is, an explanation of the procedure as for stereo-radiographs of the chest will probably serve best. The patient is placed before the Balanced Cassette Changer, the front panel of which is centered to the patient as usual. The operator then observes the reading on the scale at the rear of the cassette changer, which reading indicates the height at which the tube must be placed on the tube stand to be in exact center to the film. This height reading on the tube stand is direct, i. e., the setting is correct without any further calculating, as heretofore necessary when compensating for the tube shift from focal center.

There is no measuring required, so these settings require but a few seconds.

Another scale is provided for the tube shifting device, the setting of which (within the range of 2½ to 5 inches) is according to the distance of tube shift desired. This depends upon the distance between the tube and the film, all of which has been charted out for the operator in the directions, so that no time-consuming calculations are necessary on his part. Obviously these settings must be correct to insure the true stereoscopic effect, and as they are all automatically indicated in this unit the roentgenologist will quickly realize the important advantages offered.

This unit is of value not only for stereoscopic work, but has a wide range of usefulness in straight radiography as well. In heart, chest and gall bladder work, for instance, at long distances, and again in the radiography of cervical injuries where handling of the patient on a table is hardly possible, the apparatus helps the technician through quick dis-

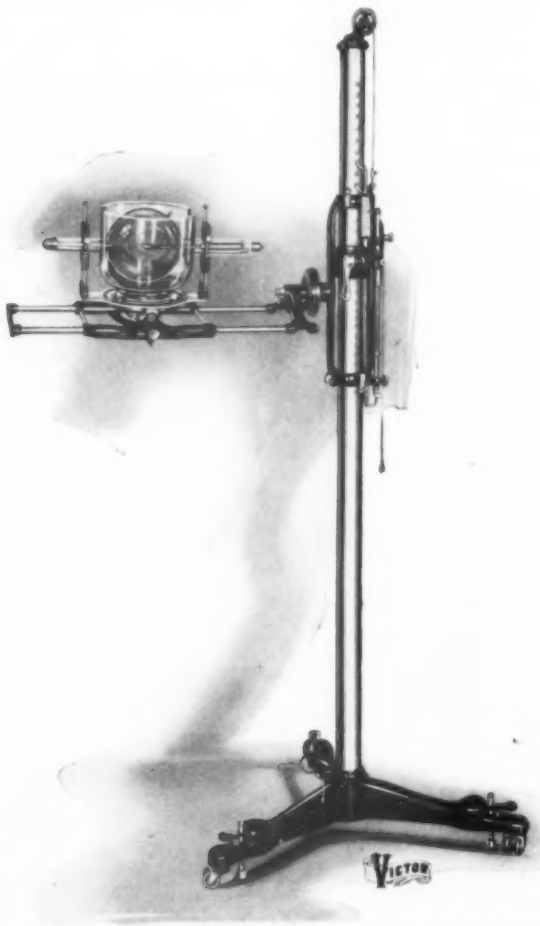

Fig. 3.—The New Victor Stereo-Shift Tube Stand Mounted on Tripod Base. The tripod base may be used instead of side rails in instances where lack of space does not permit installation of the unit as shown in Fig. 1. This tube stand is also adaptable to the side rails of any standard table, without changing the indicating scales.

patch of these cases in routine manner, at the same time realizing radiographs of maximal diagnostic value.

The change from stereo-radiography to straight radiography is by the simple arrangement through which the stereo shift may be cut into and out of operative position.

When the Balanced Cassette Changer was introduced a large number were placed in laboratories where previously the distribution of space did not accommodate similar devices, but from the fact that this unit could be installed for operation from either the right or left side, these laboratories no longer have to forego the advantages of a plate shifter. And now since it is incorporated with the stereo-shift tube stand mounted on side rails, the same holds true, as the side rails, shown in the illustration mounted on the right side, may also be mounted on the left. Any wall space may therefore be utilized for installation of this apparatus.

The trigger release on the Cassette Changer, also on the stereo-shifting device for the tube carriage, are shown in the illustration as operating by a pull cord. Both of these triggers may be tripped simultaneously through an electrical connecting cord and push button held in the operator's hand. Considering that the pull cord release must necessarily be operated on a direct line, the electrical push button method obviously simplifies matters, besides being instantaneous and simultaneous in action. These magnetic release attachments are furnished when specified, at a nominal additional charge.

If because of limited floor space, the Vertical Stereo-Radiographic Unit is not ordered complete as shown in Fig. 1, but only the Balanced Cassette Changer and the Stereo-Shift Tube stand mounted on tripod base (as in Fig. 3), it is necessary to specify the height indicator for the Cassette Changer, this being extra. Should the Cassette Changer be originally installed without this height indicator, the addition may be made any time later. The tube stand can be mounted directly to the side rails of any standard table and thus conserve space in the smaller laboratory. No change in the height reading scales is necessary in such an arrangement, which is another instance proving the advantages of standardized construction.

THE STUDENT'S LIBRARY

BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

TEXTBOOK OF OBSTETRICS. Sixth edition. By *Thomas W. Eden*, M. D., C. M. Edin., F. R. C. P. Lond., F. R. C. S. Edin., Major R. A. M. C.; and *Eardley Holland*, M. D., B. S. Lond., F. R. C. P. Lond. Cloth. Pp. 704 with 7 plates and 393 illustrations. New York: Macmillan Co., 1925.

INTERNATIONAL CLINICS. Vol. III, 36th series. A quarterly of clinical lectures and especially prepared original papers. Edited by *Henry W. Cattell*, A. M., M. D., with collaboration of the leading members of the medical profession. Cloth. Pp. 310 with 54 illustrations. Philadelphia: J. B. Lippincott Co., 1926.

PRACTICE OF OBSTETRICS. By *Clifton Edgar*, Emeritus Professor of Obstetrics and Clin. Midwifery Cornell Univ. Medical College. Sixth edition; revised by *Norris W. Vaux*, Clin. Prof. Obstetrics in Jefferson Medical College and to Jefferson Hospital. Cloth. Pp. 799 with 684 illustrations including 5 colored plates and 38 figures printed in colors. Philadelphia: P. Blakiston's Sons & Co., 1926.

HEMORRHOIDS. By *Joseph F. Montague*, M. D., F. A. C. S., of the Rectal Clinic, University and Bellevue Hospital Medical College; Lecturer of Rectal Pathology, etc. Foreword by *Harlow Brooks*, M. D., F. A. C. P. Cloth. Pp. 291 with 116 illustrations. Philadelphia: Lippincott Co., 1926.

HUMAN PATHOLOGY. By *Howard T. Karsner, M. D.*, Professor of Pathology, School of Medicine, Western Reserve University, Cleveland, Ohio. Cloth. Pp. 980 with 20 illustrations in color and 443 black and white. Philadelphia: Lippincott Co., 1926.

TUMORS OF THE GLIOMA GROUP. By *Percival Bailey* and *Harvey Cushing*. From the Surgical Clinic and Laboratory of the Peter Bent Brigham Hospital and the Laboratory of Surgical Research of the Harvard Medical School. Cloth. Pp. 175 with 108 illustrations. Philadelphia: Lippincott Co., 1926.

BOOKS REVIEWED

ATLAS OF HUMAN ANATOMY. By *Carl Toldt*, M. D., assisted by Professor *Alois Dalla Rosa*, M. D. Adapted to English and American and International Terminology by *M. Eden Paul*, M. D., Brux., M. R. C. S., L. R. C. P. Volume II. Price of two-volume series, $10.00. New York: Macmillan Co., 1926.

Such a veteran needs no introduction. As Osler has been the standard medicine, Da Costa the authoritative surgery, Toldt has become the recognized atlas on human anatomy. Designed primarily for the student of anatomy, its greatest drawback has been its cost. Heretofore three volumes have constituted the set. Without

alteration of arrangement, presenting exactly the same plates in the same order, the three volumes have been divided into two volumes. The paper is identical with that previously used. The binding is as substantial and much more attractive, yet the revised set is offered to the student for less than half the original cost. There is no excuse against, but every reason for the student of anatomy to possess this valuable treatise.

UROLOGY. *Edward L. Keyes*, M. D., Ph. D., Professor of Urology, Cornell University Medical College: Urologist to St. Vincent's and to Bellevue Hospitals. Cloth. Pp. 781 with 190 illustrations and 18 plates, 4 of which are colored. New York: D. Appleton & Co., 1926.

The revision of this book brings up to date one of our standard textbooks on urology. The work of Keyes, its author, has long been recognized, for his judgment and decision are always most carefully weighed.

With the constant advance of medical science old concepts and methods are gradually laid aside in an attempt to increase our efficiency by modern ideas. Frequently we err, the "newer" forms are found defective and the older forms are reinstated. Occasionally the alteration proves worthy of acceptance. In accepting the newer proposals, one should not allow his eagerness for advancement to overshanow his better judgment. Most carefully has the author revised this fourth edition. "Only by incessantly sacrificing the dead wood from the green may a textbook, mith each succeeiing revision, hope to become more mellow as it certainly becomes more personal."

In this, the fourth revision by the author, gonorrhea in the female and syphilis have been dropped as having no place in urology. New topics, such as suppurative inguinal adenitis, granuloma inguinale, etc., have been added. Newer methods including radiotherapy for the control of malignant growths are herein presented.

Compounded in outline form, written in simple, beautiful English, printed in a pleasing,

A TEXTBOOK OF OPERATIVE ORTHOPEDICS. By *A. Steindler*, M. D., F. A. C. S., Professor of Orthopedic Surgery, State University of Iowa. Cloth. Pp. 403 with 83 full page plates. New York: D. Appleton & Co., 1925.

It is the common criticism of the student of medicine that orthopedics, the science of the prevention and correction of deformities, is presented in a most elementary manner. The development of such a complete review of the subject should afford more liberal teaching.

"To establish selections and to draw limitations rather than to encourage or overemphasize the operative surgery of orthopedic conditions is the aim and purpose of this book." A thorough study of the literature alone was not sufficient to complete such a task, the experience and judgment underlying the author's surgical decisions being added.

Operative procedures are described after testing their intrinsic value from the physiological, biological and mechanical bases underlying their clinical applicability. Their technique is carefully described after explaining the aim and purpose initiating their use. In describing the detail procedure of these operations, time and space are not spared. To emphasize and portray the verbal description, beautiful cuts and photos are shown.

It has taken a tremendous amount of work and study on the part of the author to study, evaluate, organize and portray his subject so thoroughly and masterly. The profession owes much to Dr. Steindler.

TREATMENT OF FRACTURES. Tenth edition revised. By *Charles Locke Scudder*, A. B., Ph. B., M. D., F. A. C. S., Consulting Surgeon to Massachusetts General Hospital; formerly Assistant Professor of Surgery at the Harvard Medical School. Cloth. Pp. 1240 with 2027 illustrations. Philadelphia: W. B. Saunders Co., 1926.

Fingering through the new Scudder's Fractures brings back pleasant memories of the cramming and clinics of the senior year, the rapid review before the hurry-up drive in the

easily read style, Keyes' Urology is to be recommended.

country practice, and the dust-covered volume on the library shelf of a city specialist. The arrival of the new Scudder is like the meeting of an old friend.

Another revision of the book indicates the persistence of the author in maintaining an up-to-date standard text—responding to the demand of the teachers and students for a reliable and authentic work.

In presenting this revision the style and organization which characterized the previous publications are maintained throughout. A distinct addition is the work of contributors of special subjects. J. C. Bloodgood discusses pathological fractures, while F. W. Bancroft considers bone repair. Fractures of the mandible and maxilla are presented by Kurt H. Thoma. James B. Mennell writes on massage. Anesthesia and anesthetics is an important addition offered by Frank L. Richardson, while the subject of birth fractures is given by the authority of Edward D. Truesdell.

A recognized standard on the treatment of fractures, one does not hesitate to highly recommend the new edition of Scudders Fractures.

FRACTURES OF THE HUMERUS, RADIUS AND ULNA. *Eldridge L. Eliason,* A. B., M. D., Sc. D., F. A. C. S., Professor of Clinical Surgery Univ. Pennsylvania Medical School, with collaboration of *Ralph Goldsmith,* M. D., Instructor in Surgery, Univ. Pennsylvania Medical School, and *Eugene P. Pendergrass,* M. D., Instructor in Radiology, Post-Graduate School of Medicine, Univ. Pennsylvania. Cloth. Pp. 307 with 303 figures. New York: D. Appleton, 1925.

This text is one of a series of surgical monographs under the editorship of Drs. Lewis, Pool and Elting. The field here is limited entirely to fractures of the upper extremity.

In the first few pages of the book a most important discussion on the osteology and embryology of the long bones of the upper extremity is presented. Such consideration is essential for those who attempt the interpretation of roentgenograms taken in questionable fractures of children. A realization of this difficulty is shown by the numerous roentgenograms printed showing the various stages of ossification.

Anatomically the fractures of the upper extremity are considered, those of the humerus rightfully receiving over 100 pages discussion against 27 for the ulna and 72 for the radius. Fractures of both bones of the forearm are discussed in 72 pages. Treatment of compound or open fractures, delayed or non union, indications for operative treatment, each are separately presented.

However, a complete discussion is not presented of fractures of the upper extremity—fractures of the carpal and phalangeal bones being omitted. We feel that the writers are justified in their obvious assumption that fractures of the hand warrant separate consideration; and we hope that the same careful organization of clinical facts similarly illustrated will be included in another volume.

INTERNATIONAL ABSTRACTS

CUTANEOUS SYSTEM
SUPERFICIAL RADIATION

Units in Superficial Roentgenotherapy. George C. Andrews, M. D., Am. J. Roentgenol., 14:336-342, Oct., 1925.

The various formulas and individual methods devised for computing the dosage administered in superficial roentgenotherapy are presented and their deficiencies very clearly enumerated. This problem of dosage has been and is one of

the greatest stumbling blocks in the standardization and advancement that cosfrosts radiologists. Bachem (J. Radiol., 5:155, 1924) according to Andrews, developed a formula containing the physiobiological factor based on ionization measurements with a Furstenau instrument that was a decided improvement over the other formulae which have been devised. But this too has its faults. "It would seem that ultimately we must come to measurement of wave lengths as well as quantity of output, in order to accurately estimate dosage. A combination of spectroscope and ionization instrument calibrated to read in Duane, E. S. U., would seem of prospective importance."

RADIATION VS. CANCER

The Present Status of the Radiation Treatment of Carcinoma. George W. Holmes, M. D., Richard Dresser, M. D., Northwest Med., 25:467-471, Sept., 1926.

For the present discussion the author divides patients suffering from cancer into two groups: first, those which may be cured or greatly benefited by irradiation; second, those which show no response to treatment, and in which radiation is contraindicated.

In the first group, carcinoma of the breast stands foremost, operable or inoperable. Cancer of the lip responds better to irradiation than does cancer of the breast. In the treatment of glandular metastasis, heavy doses of copper filtered x ray and radium emanation are used. Carcinoma of the mouth presents practically the same difficulties as the lip. Cases of carcinoma of the pharynx and larynx have been considerably benefited by high voltage irradiation alone or combined with radium. Pain in carcinoma of the colon is relieved by x ray. All cases of carcinoma of the cervix uteri which enter the Massachusetts General Hospital are now being treated by irradiation. Carcinoma of the body of the uterus is still best treated by hysterectomy. Carcinoma of the bladder should not be passed upon as yet, since the experience is small—only 45 cases being under treatment. The results from radiation here have not, however, been particularly satisfactory. Only a few of these tumors have shown regression from x ray alone, and the implantation of radium has resulted in undesirable reactions. Malignant cystadenoma of the ovary, giving rise to generalized abdominal carcinomatosis, do remarkably well under radiation. The relief, however, is only temporary. Pain occasioned by carcinoma of the prostate is often relieved by irradiation.

In the second class fall those cases which are not suitable for irradiation. In this group carcinoma of the esophagus and stomach are particularly inapplicable. Primary carcinoma of the lung is affected little, if at all, by irradiation. Treatment of conditions where a slough will open up the pathway for secondary infections is contraindicated unless no other method is applicable.

Selection of the proper wave length must be given careful consideration. In general, superficially located lesions such as epitheliomata, should be treated by unfiltered x ray or lightly screened radium. Considerable necrosis will follow both the tumor and the normal surrounding tissue, but as previously stated, satisfactory healing occurs, provided the area is not too large. In locations where secondary infection is likely to occur, as in cancer of the mouth, this necrosis is a very undesirable feature. Here it is better to use heavily filtered radium or x ray which has a more selective action on the malignant tissue. Deep seated inaccessible lesions are best treated by short wave x ray.

"All cases of malignancy, whether treated by irradiation or surgery should be observed at frequent intervals. We have recently organized a special clinic composed of radiologists, surgeons and internists to handle this follow-up work."

HEMANGIOMA

The Treatment of Hemangioma at the Collic P. Huntington Memorial Hospital. Grantley W. Taylor, M. D., Boston M. & S. J., 195:737-740, Oct. 14, 1926.

Hemangioma occurred in 108 females and 85 males. Of these 13 cases were telangiectatic angimas, 13 port wine marks, 67 circumscribed superficial lesions, 6 diffuse superficial lesions, 38 deep lesions, 51 circumscribed superficial lesions involving the mucous membranes and 5 cases of diffuse deep lesions involving the mucous membranes. The dosage employed varied slightly, according to the indications. Average dosage could be given as 15 millicurie hours of the bare (steel jacketed) tube laid directly on the surface of the skin—sufficient to cause an ulcerated area about 1 cm. wide and slightly longer than the tube. Half of this "ulcerative" dose, doubled for each 0.5 mm. of silver filtration, and for each 0.5 cm. of distance above the skin surface, is the usual first dose for an angioma. Thus with a tube of 90 millicuries, filtered with an 0.5 mm. silver cylinder and elevated on 0.5 cm. wood, the first dose would be of twenty minutes duration. Such a dose would be effective over an area about 2 cm. wide and twice as long as the tube and could be repeated on adjacent untreated areas until the whole surface of the angioma had received treatment.

In this report 193 cases of hemiangioma are described and analyzed. The results of surgical treatment are given and the technique of radium emanation described. Forty-one patients received no treatment.

The author's conclusions are significant:

1. Surgical excision is the method of treatment to be preferred in small accessible hemiangiomas when a scar will not be disfiguring.

2. Radium treatment is successful in telangiectatec angiomas and in small superficial angiomas and in small superficial lesions of the skin or mucous membranes.

3. Radium treatment is moderately satisfactory in deep seated lesions.

4. Radium treatment is unsatisfactory in port wine marks and in superficial diffuse lesions.

5. Reactions with their sequelae of scars and telangiectases can largely be avoided by using only silver screened radiation.

OSSEOUS SYSTEM

CALCANEO-NAVICULAR JOINT

On the Demonstration and Analysis of Calcaneo-Navicular Coalition by Roentgen Examination. Prof. Dr. H. C. Slomann, Copenhagen, Acta Radiol., 5: 304-312, Aug., 1926.

The author, referring to his previous publication, "On Coalito Calcaneovavicularis," which appeared in the *J. Orth. Surgery* for 1921, discusses the theory concerning the combination of the anatomical anamoly with flat-foot symptoms and deformity, which he sets up there and still insists upon. The author refutes the objections to his views raised by Nove-Josserand in a memoire, "Formes Anatomiques du Pied Plat," published in the *Revue d'Orthopedie* of 1923, in which this writer refers to two young cases of coalition observed by himself, and to a case of slight flat-foot observed by Baisch, which the critic claims to be a case of coalition. From those three observations, Nove-Josserant claims that the flat-foot appearing in cases of this kind is only a temporary disability produced by reflex muscular spasm. His diagnosis of the coalition in the last case is based only on the appearance in the radiogram taken in the straight mediolateral projection, of a prominence of the antero-superior corner of the calcaneum, forming a kind of a beak, and apparently in contact with the navicular bone.

CHONDROMATOSIS

Quelques Observations sur la Chondromatose Capsulaire et sur ses Caracteres Radiologiques. H. J. Panner, Acta Radiol., 5:295-303, Aug., 1926.

Reviews of the different opinions held concerning the nature of the capsular chondromatosis. He then describes the typical roentgenological appearance of that condition, with formation of opacities—corresponding to cartilagionous tumors more or less calcified or ossified—frequently found in all parts of the capsule as well as in neighboring serous bursae. He further describes the clearly defined defective

areas in the bone, the results of the erosion produced by the pressure of the penetrating tumor. He notes particularly the absence of any deforming arthritis; only in the angle of the joint does one fairly often find small osteophytes, which should be considered as secondary formations due to the presence of too many foreign bodies in the articulation.

In most cases the roentgenological findings together with the clinical symptoms will render easy differentiation of the capsular chondromatosis from those other conditions, atrophic arthritis and asteosarcoma, with which it may otherwise be confounded.

The author is of the opinion that the capsular chrondromatosis, once its typical characteristics have become more generally recognized, will in all probability be found to occur much less rarely than at present believed.

Radiotherapy and the General Practitioner. Arthur U. Desjardins, M. D., Northwest Med., 25:471-478, Sept., 1926.

Radiotherapy is useful in the treatment of many diseases, in some of which it is actually the method of choice. In connection with malignant neoplasms it is unfortunate that only a minority of patients are permanently cured by surgery, by radiotherapy, or by any other method. This fact, however, does not prevent such methods from being most helpful to many patients. No one thinks of condemning surgery because the majority of malignant tumors operated nevertheless prove fatal sooner or later; it is realized that the results of such treatment are sufficiently good in most cases to be worth while, if only for the temporary relief afforded. The same is true of radiotherapy, which, like surgery, is sufficiently useful to deserve an important place in the treatment of many varieties of neoplasms. Indeed, if the ability to cure many diseases permanently were to become the criterion by which the value of any method of treatment is to be determined much of the vaunted modern therapeutics would have to be abandoned.

Finally the author wishes to emphasize the point that adequate radiotherapy requires not only a knowledge of the technical phases of radiology and of general and special pathology, but also a thorough understanding of their relationship. Such knowledge demands special preparation and cannot be acquired by mere purchase of a roentgen ray machine or a bit of radium.

NASAL POLYPI

Radium in the Treatment of Nasal Polypi. Sam N. Kay, M. D., Texas State M. J., 22:372-373, October, 1926.

The surgical treatment of nasal polypi is in a rather unsatisfactory state. In those who have single or only a few polypi with limited involvement of the nasal mucous membrane or sinuses, surgical removal gives temporary relief. In those who have multiple polypi in the nose, and in this class the majority of the cases fall, with all the attendant diseases of the mucous membranes of the noses and accessory sinuses, surgery whether conservative or radical gives only slight relief.

Radium is superior. The beneficial effects of radium in nasal polypi are due to its well-known property to destroy tissue, with subsequent fibrous tissue formation. It must be borne in mind that radium used in this condition must be pushed to the point of scar tissue formation. Fortunately the nose tolerates radium exceedingly well. As much as 150 mg. hours of radiation may be used weekly in the nose without danger of a burn. The method employed by the writer has been to place 50 mg. covered with rubber tissue in the affected area for two or three hours, three or four days after the removal of the polypi. This is repeated every two to three weeks until signs of scar tissue formation are seen. Where this is done, some atrophy of the upper portion of the nose where the radium is applied will be seen.

In the opinion of the writer, radium is indicated postoperatively in all cases of nasal polypi.

Radical nasal surgery will be less frequently indicated where radium is used, and the percentage of cures will be greater. The interval between recurrences will be lengthened where radium is used. The objections to the use of radium are the length of time radiation consumes, and the production of the atrophy in the region of the nose where the radium is applied.

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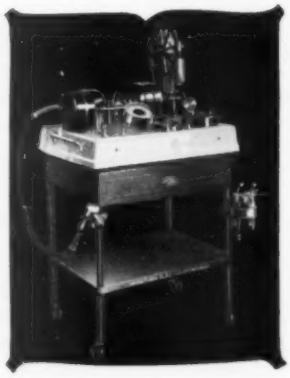

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